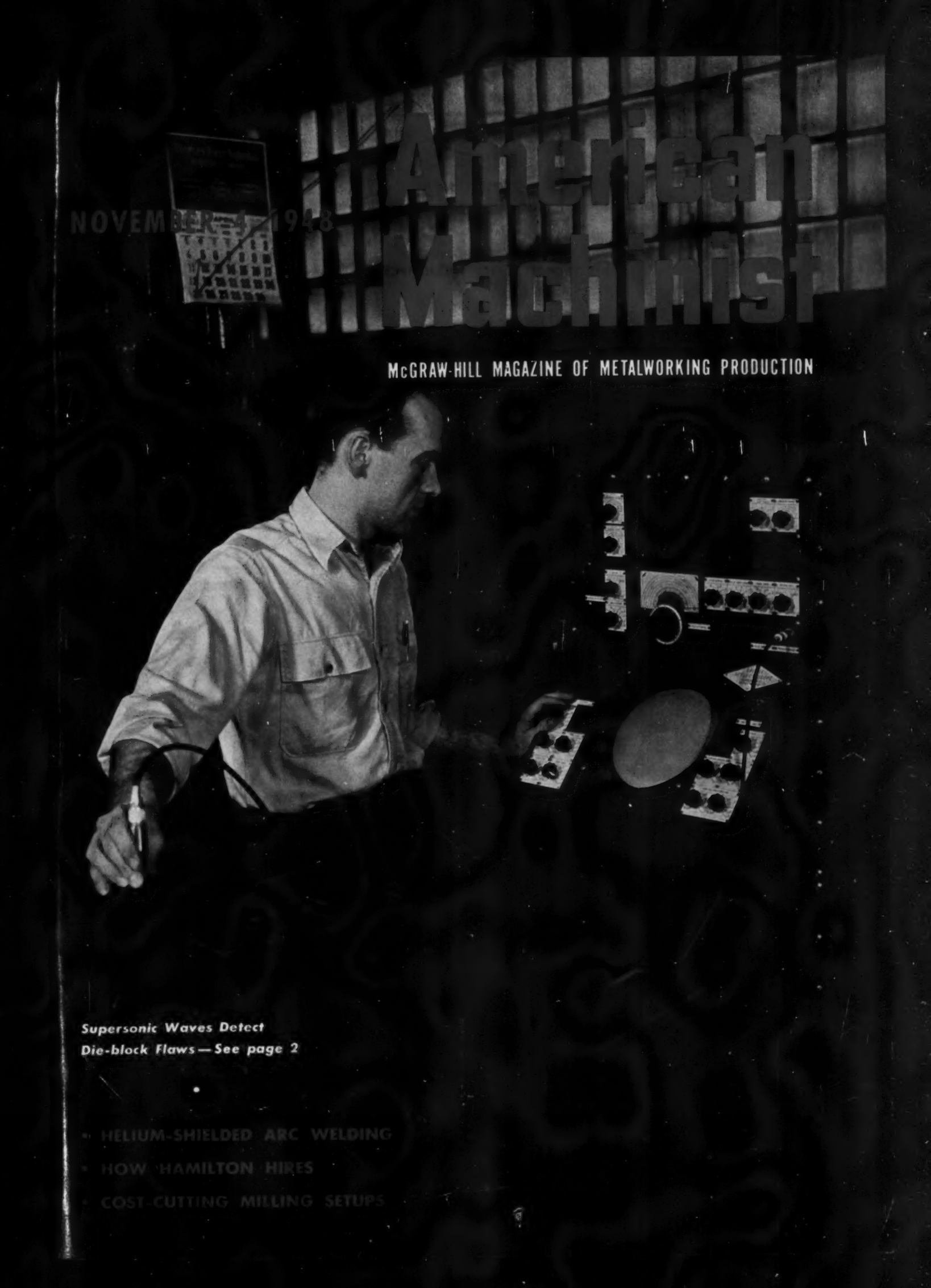
NOVEMBER 1, 1948

American Machinist

McGRAW-HILL MAGAZINE OF METALWORKING PRODUCTION



Supersonic Waves Detect Die-block Flaws—*See page 2*

- HELIUM-SHIELDED ARC WELDING
- HOW HAMILTON HIRES
- COST-CUTTING MILLING SETUPS

SPEED-UP YOUR PISTON PRODUCTION

New **HEALD** Bore-Matic finishes more than 1600 piston pin holes per shift from cast hole.

√R v.926 Nov.-Dec. 1948

The production of aluminum-alloy pistons, like so many other automotive parts, calls for very high standards of precision. But that's not all; parts must be produced rapidly, with minimum effort and attention. The new Heald Bore-Matics meet *both* requirements.

For example, the two-station, end-operated Heald Model 221 Bore-Matic shown above, handles (at 70% efficiency) over 200 pistons an hour—or more than 1600 pistons in one 8-hour shift. Designed for automatic, two-way boring of pin holes in two pistons simultaneously from the rough casting, this machine holds tolerances of less than .0001 for roundness, and .0002 or .0003 for size as required, under average conditions of stock removal (.040-.060 on diameter).

Whatever *your* borizing operations, you'll find a Heald machine that can meet your precise requirements—for faster, easier, lower-cost production. For further information on the new Bore-Matics, get in touch with your nearest Heald representative, or better still, call on us here at Worcester.

Are you ready for '49 production?

For the automotive industry, 1949 will be a year of challenge. For as production catches up with demand, there is more and more emphasis on cutting manufacturing costs, through the use of more efficient machine tools. These new machines are available now, to give you both increased production and greater precision, at lower cost. Heald engineers will be glad to discuss your specific problems.

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CONTENTS for NOVEMBER 4, 1948 . . . . VOL. 92, NO. 23

Cover .....*Operation pictured is described on page 2*

ADMINISTRATION

Editorial .....*Burnham Finney* 83
How Hamilton Hires.....*John L. Owens* 85
Rest for the Weary?.....*Round Table* 119
America Must Have Better Tools.....*James H. McGraw, Jr.* 124

SPECIAL REPORT

How to Use Helium-Shielded Arc Welding.....*Harold O. Jones* 101

ENGINEERING

Chart for Lineshaft Calculations.....*(RBS)* 137

FINISHING

Spatter Mix Mixes Scale.....*Francis Aimers* 124
Process Sheet for Calorizing Steel.....*(RBS)* 135

MAINTENANCE

How to Recondition a 10 x 20-ft. Surface Plate....*Rupert LeGrand* 92

MATERIAL CUTTING, FORMING

Diesel Bearings Cast in Sheet-Steel Flasks.....*C. O. Donley* 89
Cost Cutting Milling Setups.....*Allen F. Clark* 94
Precise Processing Produces Flatirons Faster.....*Leo J. Pantas* 98
Razor-Blade Tool Finishes Lead.....*G. R. Milner* 123
Socket Head Forms Box Wrench.....*Orion S. Wretley* 124
Tooling Angles for Machining Meehanite.....*(RBS)* 139

TOOLING

Short Cuts .....*A. H. Waychoff* 97
Talented Tooling—3..... 118
Double-Acting Screw on Vise Fixture.....*Clifford T. Bower* 120
Radius-Cutting Lathe Tool Mounted in Toolpost..... 120
Toolholder Tackles Heavy Cuts.....*George W. Wilson* 121
Rocker Arm Actuates Bore Checker.....*Jay M. Clark* 122
Caliper Leg Mounts Indicator.....*W. A. Dice* 122
Block Clamps Boring Bar.....*Ray Cafiero* 122
Center Set Equips Standard Lathe.....*Charles Homewood* 123
Air Gun Ejects Thin Shells.....*Charles Schwartz* 123
Lathe Mount Drives Gas Torch.....*Paul Redl* 123
Wing Belt Clamps Drill Pad.....*M. Shortell* 124
Stud and Setscrew Bind Inside Fixture Handle....*B. D. Campbell* 124

NEWS OF METALWORKING

Spot News 79
Gaging Metalworking..... 80
Detroit News..... 132
Names in the News.....183-188

DEPARTMENTS

Talking Shop..... 117
Reference Book Sheets.... 135
Shop Equipment News..... 141
Parts and Materials..... 156
Round Table Discussions.... 166
To the Editor..... 181
New Books..... 182

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Chips and QUIPS

Our Cover . . . Echoes locate defects such as cracks, ruptures or voids nondestructively in steel dieblocks at Heppenstall Co., Pittsburgh. Blocks now pass a Sperry supersonic Reflectoscope. When the operator puts the contact element on a block, supersonic or ultrasonic (much shorter, but like, audible sound) waves (frequency 1, 2¼ or 5 megocycles) are transmitted to the block by a quartz crystal ground to proper wavelength. If top and bottom surfaces are fairly parallel, the wave is reflected from the bottom back to the crystal, just as an echo comes back from an opposing surface. Just as the elapsed time between initial sound and echo can be measured and converted into a distance, so can the supersonic "back reflection" be shown. The difference is that both initial pulse and reflection are shown on the sweep line of a 9-in. cathode-ray oscilloscope.

The sweep line is calibrated and adjusted against a standard block so each half-cycle or square section represents a known linear distance. Further, the instrument is tuned to eliminate coarse-grain reflections. Then, any defect will create its own echo, which will appear as a reflection between the initial-pulse line and the back-reflection line. Its distance from top or bottom surface is shown directly by half-cycles or squares between lines. Experienced operator Adrian Fallert can locate defects within ⅛ in. and can suggest the type by outlining the defect. Angular flaws cause a change in the strength of reflection. Even blocks with rough-planed surfaces can be checked, so all blocks now are sonically inspected.

Helium-shield . . . Some months ago, we asked several engineers of big welding-equipment makers: "What's the biggest, and hottest, welding development today?" They are unanimous in choosing helium-shielded arc welding. So we had our current special report prepared about it . . . There are one or two still-newer developments, but they're still under test. Copies are available.

Tooling . . . We have five tooling stories in this issue, covering many machining operations and several products . . . First, Allen F. Clark, time standards engineer at Pitney-Bowes, Inc., shows how important sensible setups are in cutting milling costs . . . Then Rupert LeGrand tells how the Naval Gun Factory reconditions a surface plate (see our biographical sketch) . . . C. O. Donley, Bearing Section engineer for the G. M. Allison Div., describes how bronze diesel bearings are cast in sheet-steel molds and machined thereafter. Accurate machining and close inspection produce long-lived bearings—witness a recent case in which an engine was dismantled after two million miles service in an Electro-Motive diesel locomotive on a western railroad and the bearings found O.K. . . . Lee J. Pantas, manager of the Buffalo plant of Yale & Towne, describes tooling for a die-cast flatiron shoe with a cast-in heating element . . . Then there's another installment of our "Talented Tooling" series and our usual Practical Ideas.

Hiring a Type . . . Hamilton Watch Co. needs workers with dexterity and patience. So in 1933 the company began pre-testing potential employees. John L. Owens, who is supervisor of this work describes how it's done, including the punched cards that give quick answers on characteristics and followup system that tests the tests to be sure that what they indicate actually is true.

Coming . . . Nov. 18 *A.M.* has quite a diverse content . . . The most unusual is on electroforming, the metalworking process by which the metal is built around the holes or other complex shapes. Here is the fabled "putting-on tool" in practical form, used for pitot and venturi tubes, fine screens, even fountain-pen caps . . . The lead article explains silicones and their applications in Metalworking, others describe how to machine Vitallium (the "unmachinable" material), precision casting of Dynaflow rotors, cutter storage, a fabulous tool-crib system, and a "different" motorized wheelbarrow . . . Then a contract-shop owner shows you how to save money in dealing with him in one of the easiest-to-read stories we've had in years, and two Californians provide an easy way to determine the carbon content of steel. "Shorts" include a pentagonal layout table and a special conveyor and feed rig on an automatic lathe.

NAVY MECHANIC . . . Luther E. Lee, Quarterman Machinist, Shop No. 1, Naval Gun Factory, Washington, is the kind of a man that an editor enjoys meeting. For he, who by civilian standards is a combination of general foreman and master mechanic, is not afraid to tackle a difficult job and to work out methods and equipment for doing it. Recent articles attest to his skill: a method for reconditioning a large surface plate, a jump-cut tool for interrupted cuts on boring-mill and planer work, and a method for aligning a straight-edge.

Mr. Lee followed the long road that has brought many another man to competence in his field. In 1912 he became an apprentice at the Sumpter Machinery Co., Sumpter, S. C., later worked in several plants in the South and in railroad shops. But he likes Government service, because of the variety of work. So he has 25 years' service with the Washington Navy Yard and the Torpedo Station at Alexandria, Va.

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CHUCKS
ARBORS
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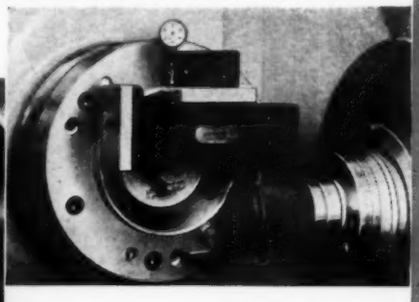
Designed for rigidity, concentricity, accuracy of size, with ample uniform force provided for holding the gear properly, ease of chucking and dechucking the gear.



Advantages of obtaining work holding equipment from the manufacturer of the machine itself:

KNOW HOW—full knowledge of machinery capacities and design features make it possible for us to design the most adequate work holding equipment for any given bevel gear job.

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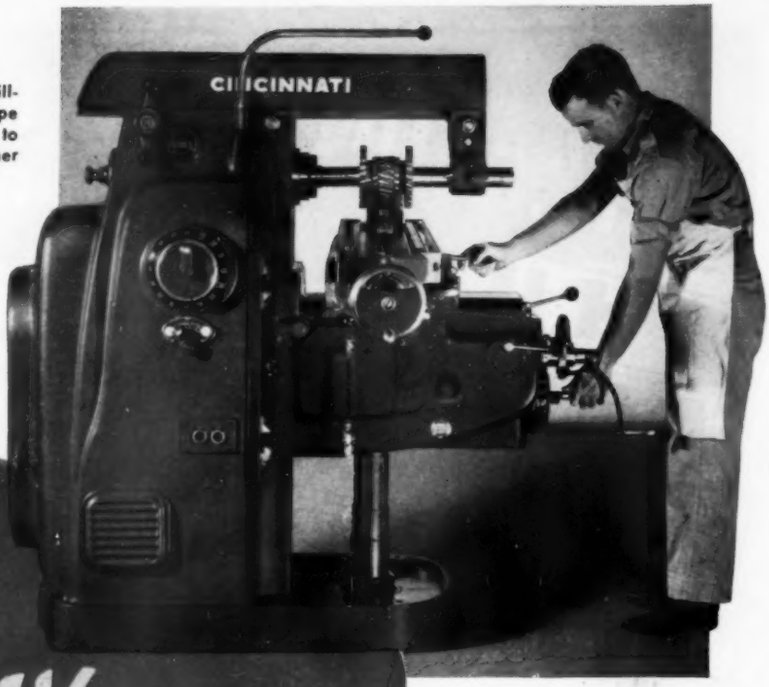
Builders of Bevel Gear Machinery for Over Eighty Years

Right: **Changing feeds on a CINCINNATI No. 2MI Milling Machine. It's easy as pie. A single crank type control selects the complete range of feeds, ¼" to 30" per min., one half turn per increment, either direction.**



CINCINNATI

THE EASY MI WAY...

encourages high metal cutting efficiency

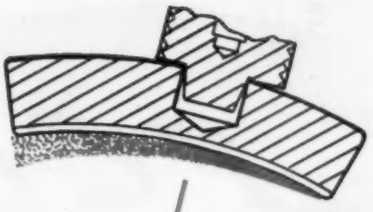
Below: **Changing spindle speeds of a No. 2MI Milling Machine while standing at the front operating position. A single crank type control selects the complete range of speeds, 25 to 1500 rpm; one half turn per increment, either direction.**

● Everyone benefits from high metal cutting efficiency. Of course, many complex factors are involved, and quite often the machine operator has the last word. If speeds and feeds are cumbersome and difficult to select, cutting efficiency usually fares badly. That's why Cincinnati Milling pays so much attention to operating convenience. The CINCINNATI No. 2MI, for example, offers quick, easy and convenient speed and feed changes. With very little effort, the operator can set the stage for high metal cutting efficiency. This machine has many other labor-aiding and cost-reducing features, too. Write for catalog M-1506-1.

THE CINCINNATI MILLING MACHINE CO.

CINCINNATI 9, OHIO, U. S. A.

MILLING MACHINES • BROACHING MACHINES • CUTTER SHARPENING MACHINES
FLAME HARDENING MACHINES • OPTICAL PROJECTION PROFILE GRINDERS • CUTTING FLUID



You can forget about the spindle bearings

. . . IN CINCINNATI FILMATIC GRINDERS

Close-up of a roll ground on a CINCINNATI FILMATIC Traveling Table Roll Grinding Machine. The FILMATIC reflection is indicative of the exceptionally good finish and accuracy which can be obtained on these machines. The everlasting FILMATIC bearings contribute their share in attaining these results. For brief data on the entire CINCINNATI FILMATIC line, write for general catalog M-1646.

ALL CINCINNATI GRINDING MACHINES AND CINCINNATI CENTERLESS LAPPING MACHINES ARE FILMATIC EQUIPPED.

Left: The FILMATIC principle. Self-adjusting shoes, submerged in filtered circulating oil, produce independent converging oil films which develop high radial pressures, maintaining "dead center" rotation of the grinding wheel spindle.

More than ten years ago, the first FILMATIC grinding wheel spindle bearings were installed in a CINCINNATI Grinding Machine. The resulting advantages were so great that shortly thereafter all CINCINNATI Grinders were FILMATIC equipped

During the intervening years, over 99% of these machines have never required time off for the grinding wheel spindle bearings. And this period includes the war years, when machines were run all day and all night; many by inexperienced operators.

In addition to the big saving in maintenance, CINCINNATI FILMATICS offer an important incidental saving . . . you don't have to adjust them for finishing grinding. They're no worry at all—they're self-adjusting for any grinding condition from "cutting air" to the heaviest stock removal job that the motor will handle. There are other advantages, too. FILMATIC catalog G-578 tells you all about them.

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"Full-Tool" Shaving in Step

"FULL-TOOL" SHAVED IN 23 SECONDS!

"FULL-TOOL" SHAVED IN 15 SECONDS!

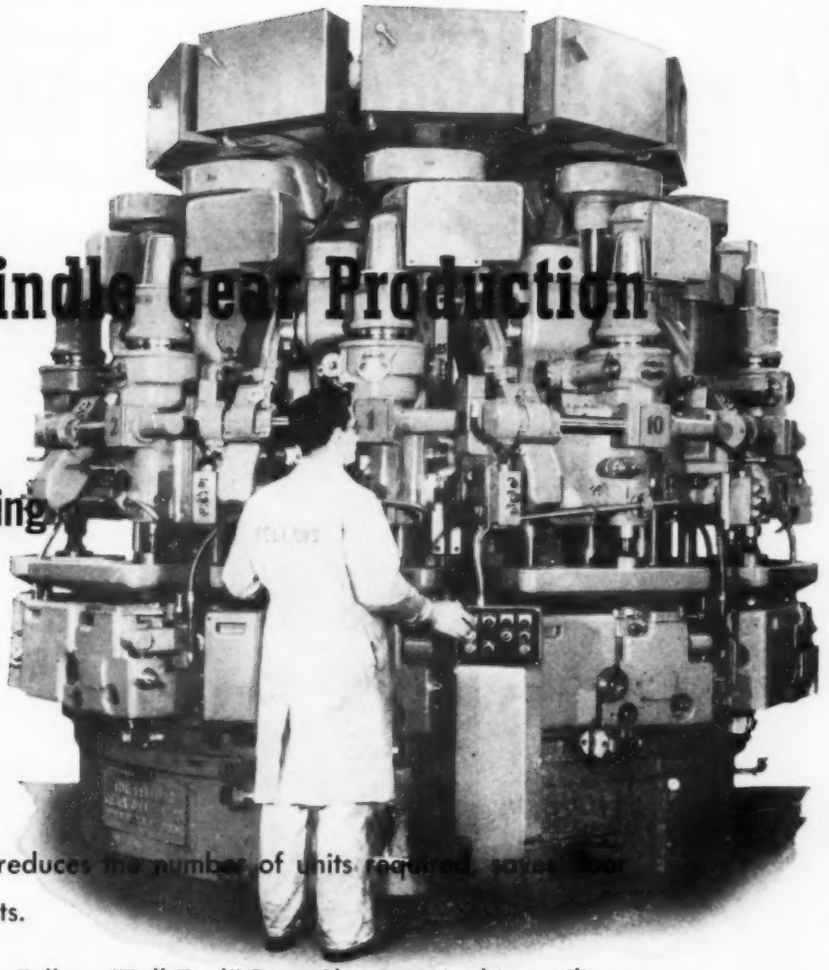
GEAR DETAILS

⬅ GEAR A		⬆ GEAR B
SAE 1050	Material (Steel Forging)	SAE 1024
23	Number of Teeth	23
16	Normal Pitch	10
20°	Normal Pressure Angle	14°
15°47'43"	Helix Angle	42°36'30"
1¼"	Face Width	1"
.0002"	Lead Limit	.0002"
.0005"	Involute Limit	±.0004"

GEAR SHAPERS • THREAD GENERATORS • CUTTERS • SHAVING AND BURNISHING MACHINES

Speed

with Multiple-Spindle Gear Production



- **Production on a single Fellows "Full-Tool" Shaving Machine in many cases equals the output rate of a multiple-spindle gear cutting machine**

Such high production per machine reduces the number of units required, saves floor space, overhead, and operating costs.

The improved tool-application on the Fellows "Full-Tool" Gear Shaving Machine utilizes higher reciprocating speeds and provides (1) freer cutting, (2) also a finer finish, (3) coupled with less wear and consequently longer life of the shaving tool.

Every plant manager utilizing the latest methods of gear production will want to know more about the Fellows "Full-tool" method of faster low-cost gear finishing. For complete information write or call the office nearest you.

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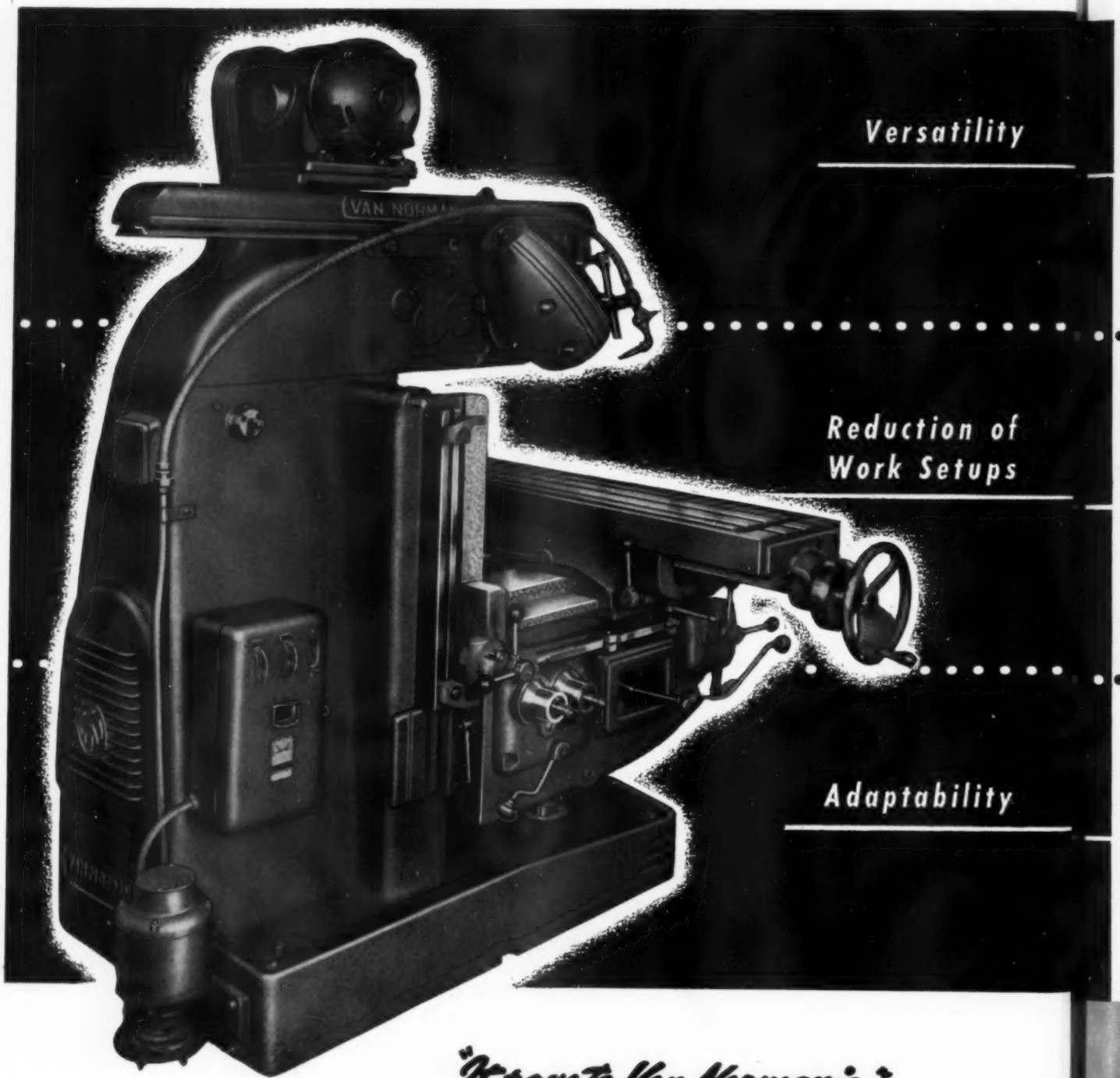
It's VAN NORMAN No. 36 Ram Type Miller

• Saves Setups • Cuts Idle Machine Time

• Increases Production



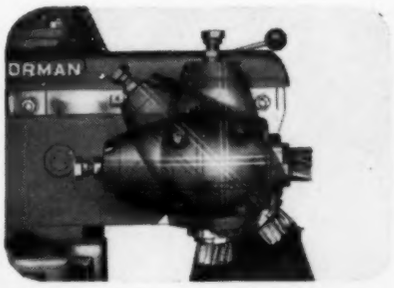
"It pays to Van Normanize"

The versatility of the Van Norman ram-type milling machine provides a greater work range than available on single purpose machines.

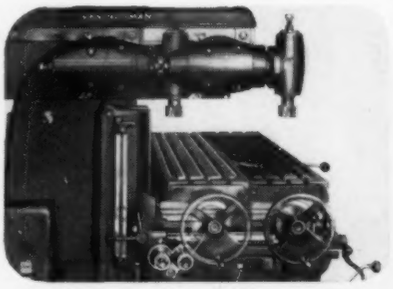
The adjustable cutterhead in combination with the movable ram enables you to perform conventional horizontal and vertical as well as angular milling. This feature cuts setup time by as much as 50% . . . increases productivity proportionately. In addition, front and rear directional controls of power feeds simplify operations . . . cut operator fatigue.

The Van Norman No. 36 Miller is ideal for use in the tool room, job shop, pattern shop, experimental laboratory, die and mold shop and for production work.

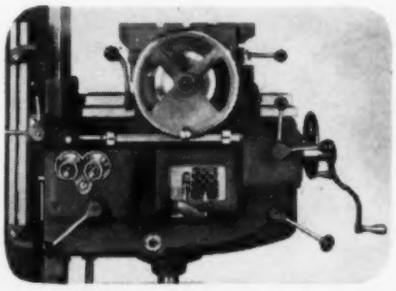
Write for illustrated bulletin, today.



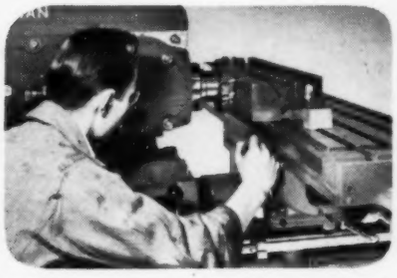
Adjustable cutterhead permits vertical, horizontal or angular milling on one miller. Its versatility is equal to three single-purpose machines.



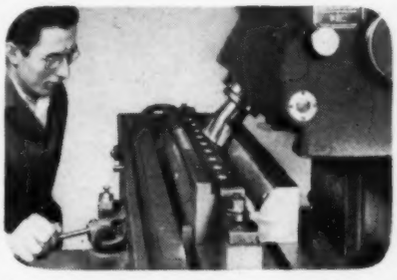
Adjustable cutterhead and movable ram in combination with the saddle crossfeed provide maximum milling capacity and versatility.



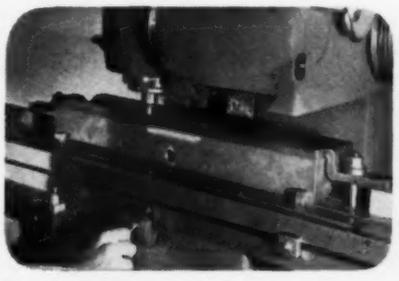
Front and rear directional control of hand and power feeds give complete visibility and control of operations from either location. Reduces worker fatigue . . . improves work accuracy.



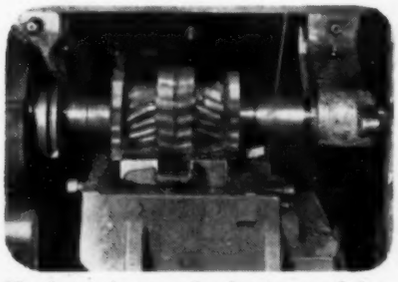
Horizontal milling—with cutterhead locked in horizontal position, operator uses rear directional controls and starts with a face milling operation.



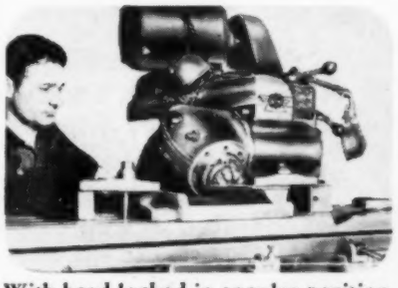
Angular milling—Here a V is being milled. Note that only the position of the cutterhead has been changed; workpiece is still in original position.



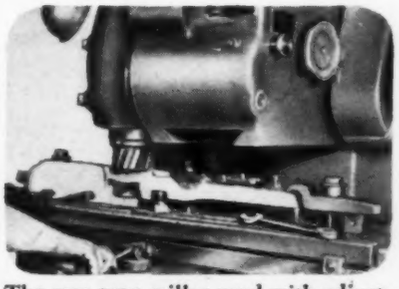
Vertical milling—Operator completes job with recess milling operation, using front directional controls. One work setup with simple cutterhead position changes completes most jobs.



Horizontal setup for boring and facing operation. The ram-type overarm with dovetail ways and outer support assures rigidity and accuracy.



With head locked in angular position the operator is taking an angular cut and operates the miller with the rear directional controls.

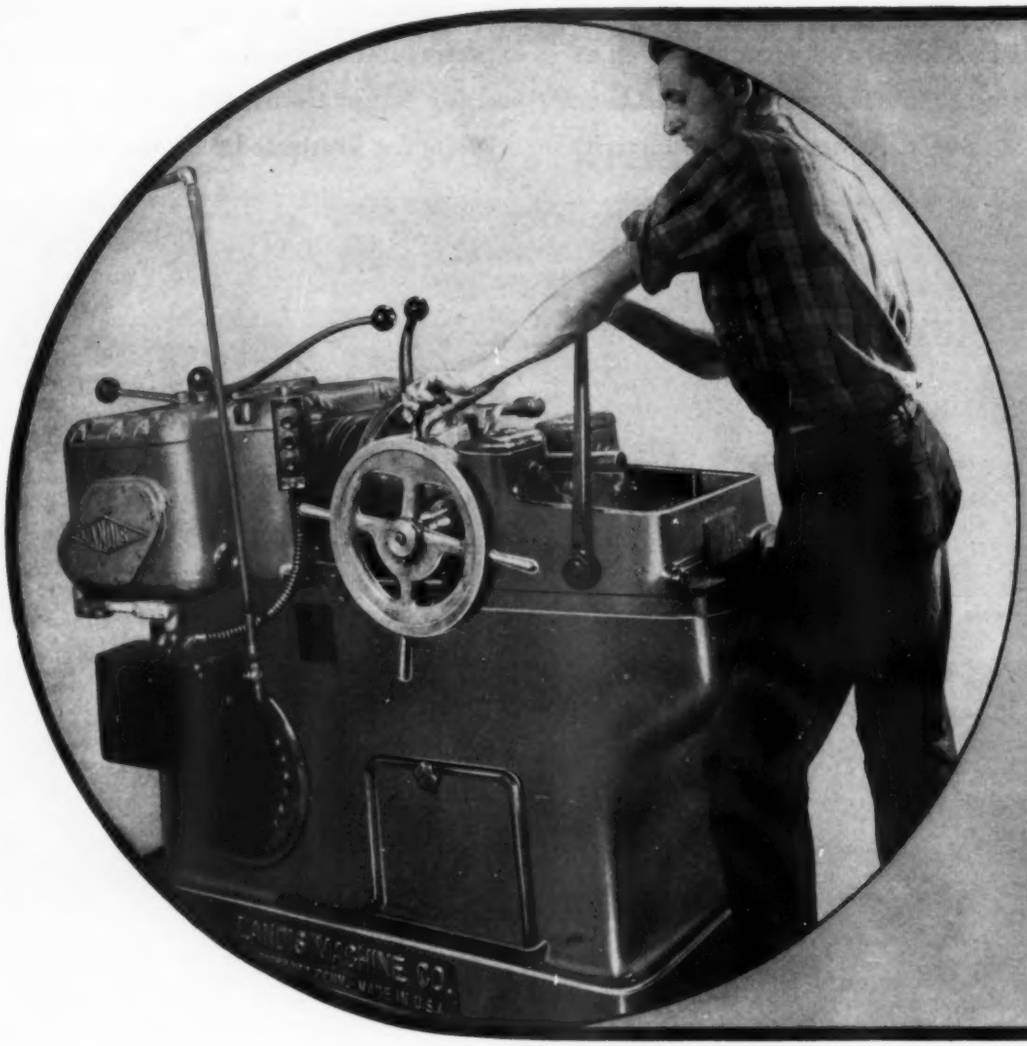


The ram-type miller used with adjustable cutterhead in the vertical milling position . . . operator using front directional controls.

VAN NORMAN COMPANY

Springfield 7 *Massachusetts*

LANDMACO *Pipe*



. . . . threads, reams, and

The Landmaco Single Head Pipe and Nipple Threading Machines, equipped with the Lanco Semi-Receding Internally Tripped Pipe and Nipple Die Head, is illustrated producing 1¼" diameter tapered pipe threads on blank steel pipe. The machine is being operated at approximately 63 R.P.M., and is producing nipples at the rate of 112 an hour.

FOR FURTHER DETAILS WRITE

LANDIS MACHINE CO.

and Nipple THREADING MACHINE

chamfers . . . . in one operation

The nipples are reamed, chamfered, and threaded in the same operation. The INTernal-Trip mechanism of the Die Head insures a uniform length of thread. While being used in the illustration to produce special length nipples for the company's own use, the LANDMACO is a high production hand-operated tool of thoroughly modern design. It is built in both single and double head models, in 1¼" and 2" sizes.

FOR BULLETINS D-67 & D-84

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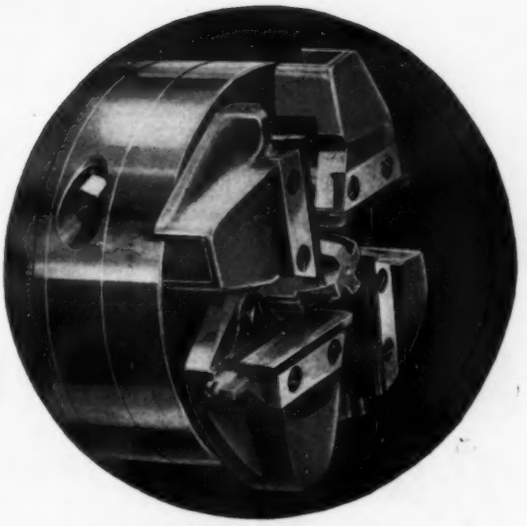
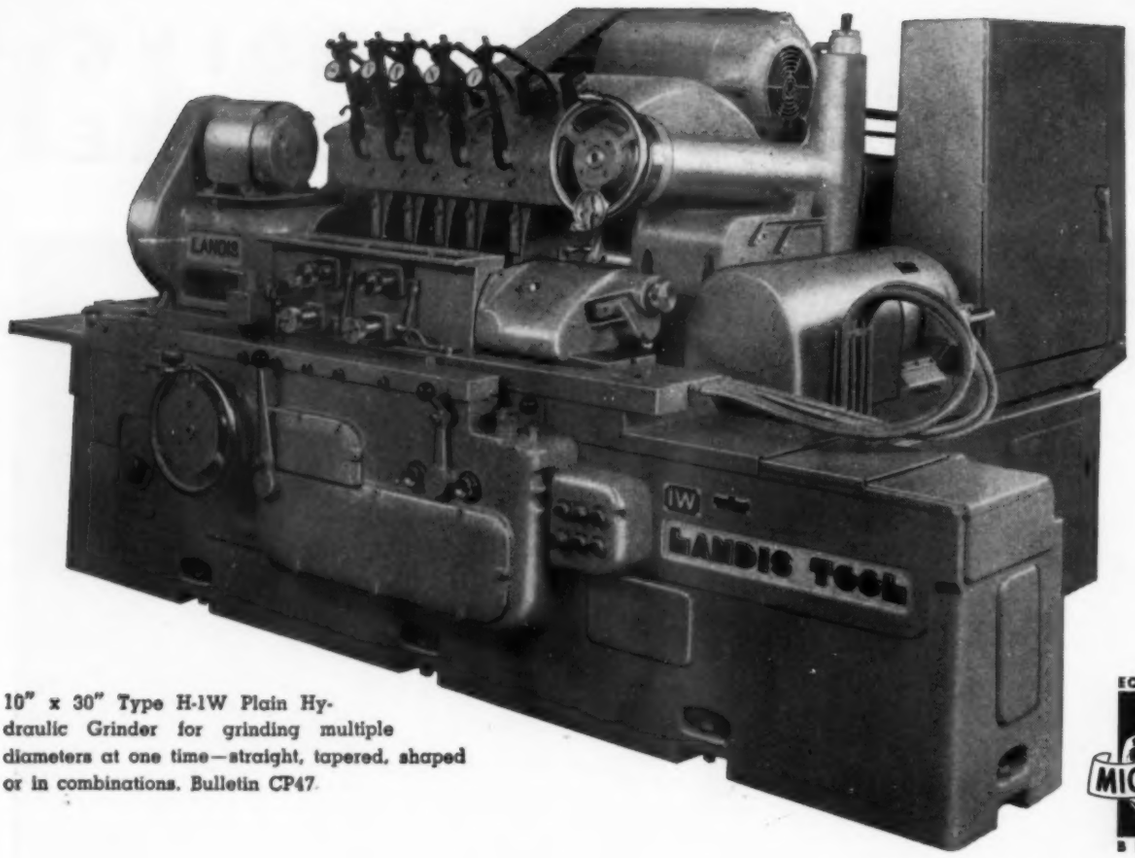
PENNA · U · S · A



LANCO SEMI-RECEDING INTERNAL TRIP PIPE AND NIPPLE DIE HEAD

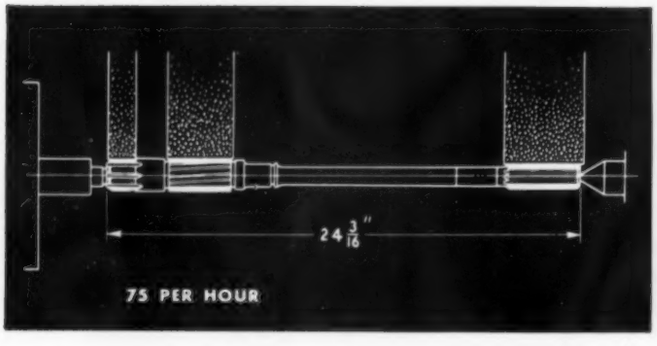


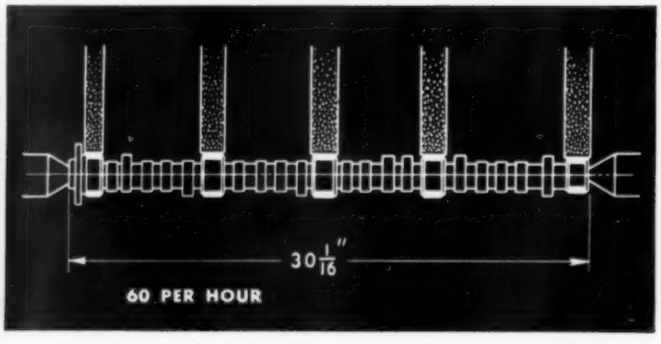
10" x 30" Type H-1W Plain Hydraulic Grinder for grinding multiple diameters at one time—straight, tapered, shaped or in combinations. Bulletin CP47

EQUIPPED WITH MICROSPHERE BEARINGS

New Multiple Wheel Grinder Gives Big Reductions

- Cuts unit costs
- Increases production





LANDIS TOOL *Precision Grinders*

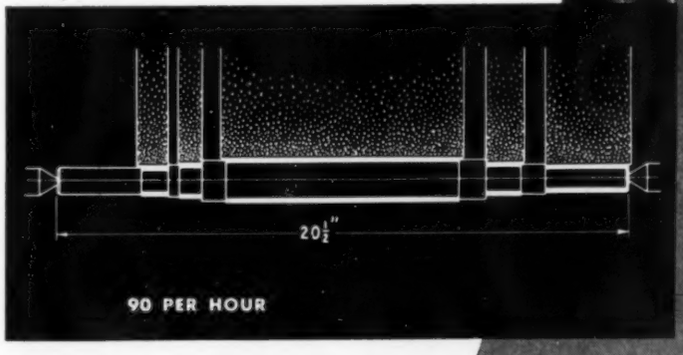
Our engineers will be glad to make production estimates and tooling suggestions on the basis of your blue prints.

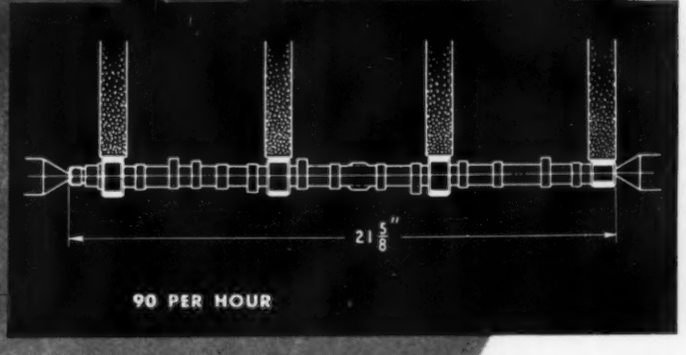
high production features

PRESSURE LUBRICATED MICROSPHERE
WHEEL SPINDLE BEARINGS
TAMPER-PROOF FEED and TRAVERSE
ADJUSTMENTS
HYDRAULIC GRINDING WHEEL FEED
Hydraulic rapid infeed
Hydraulic slow grinding feed
AUTOMATIC HYDRAULIC BACKRESTS
TWO-SPEED HYDRAULIC WHEEL DRESSING
Automatic Rapid traverse
between wheels
PROFILE BARS FOR WHEEL DRESSING

in Grinding Costs

5 different diameters and flange face ground at the same time by infeed grinding with 5 different wheels on the same spindle.





LANDIS TOOL COMPANY / 10 E. SIXTH STREET / WAYNESBORO, PA.

92

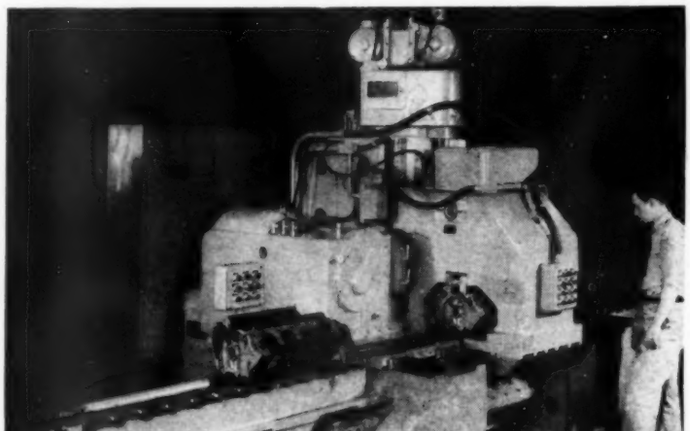
HOW to Get Better Milling Methods on High Production Work

With Sundstrand "Engineered Production"

Basically, there are two approaches to solving milling production problems, (1) obtaining standard machines, then trying to process parts over these machines as economically as possible, (2) designing the most profitable processing method, then obtaining machines to suit this method — standard or semi-standard machines, if possible, or entirely special machines, if necessary . . . This latter method is Sundstrand "Engineered Production" . . . the most practical approach to economical milling. Here are five examples of practical solutions to high production milling on special machines. "Engineered Production" also results in most economical methods on low and medium size production. Call in a Sundstrand engineer. There is no obligation for his service.

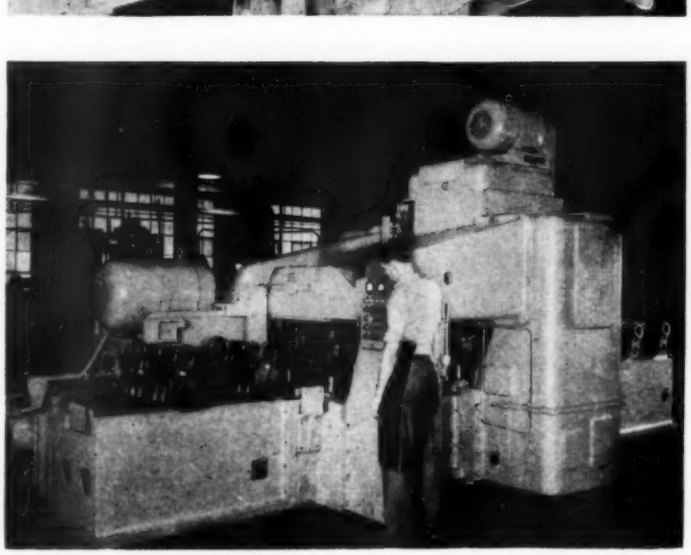
Milling Both Ends and Bearing Faces of Cylinder Block in one Automatic Cycle

This special Sundstrand Rigidmil mills both ends and bearing faces of a cylinder block with one automatic locating and clamping of the part. The block enters loading position onto hydraulically operated shuttle. In an automatic cycle started from push button station, the block is shuttled into a rise and fall fixture where it is automatically clamped. Two 15 HP opposed horizontal heads feed crosswise to face mill both ends of block; at end of stroke, cutters retract and heads rapid return. Fixture then feeds downward to straddle mill main bearings. When straddle milling operation is completed, fixture rises, and clamps are released, ending the cycle. At start of next automatic cycle, the finished block is shuttled out the opposite side of fixture as another rough block enters.



Process Type Rigidmil Works on 2 Blocks at Each Milling Station

This process type Sundstrand Rigidmil is designed to face mill the front end surface and straddle mill the main bearings of cylinder blocks. Four blocks are machined simultaneously and are shuttled through the machine automatically between milling operations. Operations performed as follows: two blocks move into first station and are automatically located and clamped. A two spindle horizontal head mills front ends. Clamps then release and same two blocks move to second station. After being located and clamped again the main bearings are straddle milled by a vertically fed head. Blocks are then unclamped and shuttled out of machine at a production rate of approximately 120 cylinder blocks per hour.

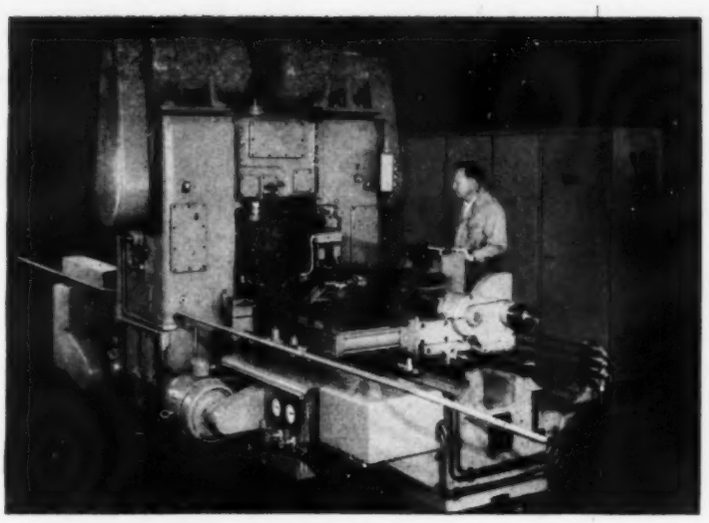


SUNDSTRAND MACHINE TOOL CO. ROCKFORD, ILLINOIS, U.S.A.

RIGIDMILS • FLUID-SCREW RIGIDMILS • AUTOMATIC LATHES • HYDRAULIC EQUIPMENT

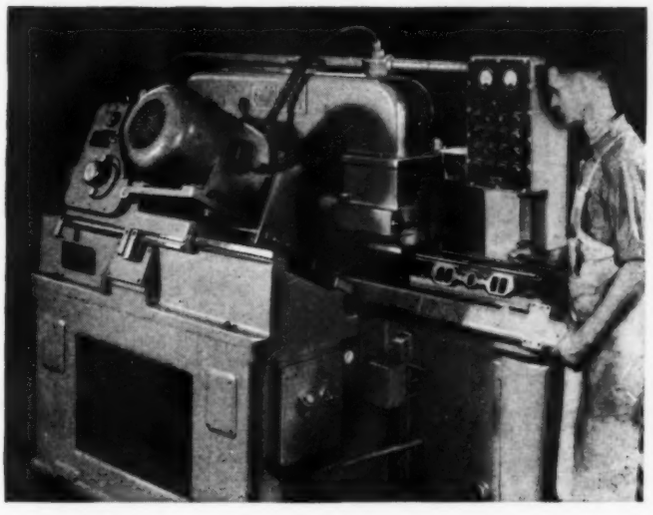
6 Spindle Rigidmil with Automatic Loading, Clamping, Milling and Unloading Cycle Mills 4 surfaces on Cylinder Block

This Sundstrand Special Rigidmil has a 6-spindle bridge type head, through which automotive cylinder blocks are fed to rough mill the top, rough and finish mill pan rail, mill pump pad and valve tappet cover pad. One horizontal spindle at rear mills top of cylinder block. The 3 horizontal spindles in front rough and finish mill pan rail while two vertical spindles mill the fuel pump and valve tappet cover pad. Machine has incoming and outgoing conveyor with automatic loading, clamping and unclamping and unloading. Operator's only duties are to start and stop machine cycle, as the machine has a full automatic cycle. The single horizontal spindle and two vertical spindles are driven by a 50 HP motor. The remaining 3 horizontal spindles are driven by one 40 HP motor. TC tipped cutters are used on all spindles.



3 Station Transfer Type Rigidmil Mills Top, Bottom and Both Sides of Cylinder Head

This Sundstrand Special Rigidmil mills the top, contact face, manifold pad and accessory pad side of a cylinder head in one automatic handling. Part is shuttled into fixture of first unit and is automatically positioned and clamped. A 25 HP traveling head with one horizontal and one vertical spindle mills top and accessory pad side. The clamps release, and the part is shuttled into the second unit, a fixture which turns the part over. The part then enters fixture of third unit. Another 40 HP traveling head, with vertical spindle, mills the contact face. At the end of this operation, clamping pressure releases, and the part moves into the fixture of fourth unit. A 15 HP traveling head with horizontal spindle mills the manifold pad. When finished, part is shuttled to unloading station and onto conveyor.

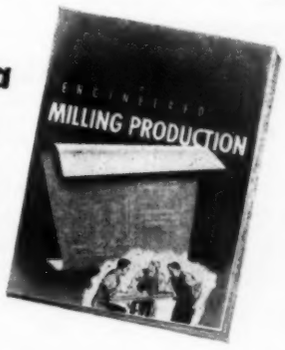


Special 6 Spindle Rigidmil Mills 4 Sides of Cylinder Head in One Automatic Cycle

This special Sundstrand Rigidmil mills angular face, pads on opposite side and at both ends of cylinder head simultaneously. Transfer of the part through 3 stations, locating and clamping in the working station and cycling of the heads is completely automatic. First, the work rolls onto loading station from conveyor. Then, in fully automatic cycle, part is shuttled into fixture and clamped; the single spindle angular head starts its horizontal feed to mill angular face — while the 5-spindle head feeds vertically to mill 3 side pads and a pad on each end. When all cuts have been completed, angular head cutter retracts to clear work and both heads rapid return. Clamps release finished part which is then automatically shuttled out of fixture as another rough part enters. Production is approximately 65 Cylinder Heads per hour.

FREE Additional Data

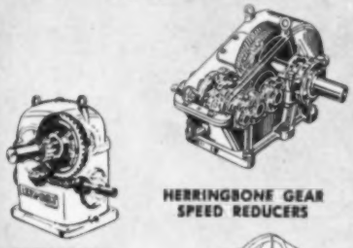
Write for more proof of the successful application of Sundstrand "Engineered" milling production. This 40 page book contains over 35 actual problem solutions together with interesting tooling diagrams. Write for your copy today. Ask for Bulletin No. 177.



SUNDSTRAND
MACHINE TOOL COMPANY
2533 Eleventh St. • Rockford, Ill., U.S.A.

DRILLING AND CENTERING MACHINES • SPECIAL MILLING AND TURNING MACHINES

OTHER TYPES OF LINK-BELT POWER TRANSMISSION MACHINERY



HERRINGBONE GEAR SPEED REDUCERS

WORM GEAR SPEED REDUCERS

HELICAL GEAR SPEED REDUCERS

GEARMOTORS

ELECTROFLUID DRIVES

P.I.V. GEAR SPEED VARIATORS

SILVERLINK ROLLER CHAIN DRIVES

SILENT CHAIN DRIVES

STEEL AND MALLEABLE CHAIN DRIVES

V-BELT DRIVES

UNMOUNTED BALL AND ROLLER BEARING UNITS

ROLLER BEARING MOUNTED UNITS

BALL BEARING MOUNTED UNITS

BABBITTED BEARINGS

TRY TO BEAT LINK-BELT SILENT CHAIN DRIVES

- - FOR LONG LIFE!

Like "Ole Man River" they just keep rolling along! The three drives shown above, were installed sixteen years ago, connecting 20 h.p. motors with overhead line shafts, operating 28 screw machines at The Weatherhead Co., Cleveland. Year after year, they continue to deliver their full quota of horsepower, without slip and with negligible upkeep or attention.

Engineers and plant executives faced with the need for increased production and reduced costs will appreciate the old fashioned advantages of low investment, low operating costs, high efficiency and long life found in Link-Belt Silverstreak Silent Chain Drives. Link-Belt power transmission specialists will gladly aid you in gaining these advantages for your plant.

Link-Belt Silverstreak Silent Chain Drives range in size from 3/16" pitch to 2.5" pitch and have been built in widths up to 48 inches. They run slack on short centers, absorb shock loads, and when properly enclosed and lubricated, are not affected by temperature variations or periods of idleness. Drives from ½ to 50 h.p. are carried in stock by distributors and factory branch stores throughout the country. Send for catalog.

LINK-BELT COMPANY

Chicago 9, Indianapolis 6, Philadelphia 40, Atlanta, Dallas 1, Minneapolis 5, San Francisco 24, Los Angeles 33, Seattle 4, Toronto 8.
Offices, Factory Branch Stores and Distributors in Principal Cities.

11,012

LINK-BELT

Power Transmission Machinery

. . . the New Series 1260 General-Purpose Counter

This new 1260 Veeder-Root Counter has the *newsiest* New Look among all things that count . . . a compact, streamlined case of pleasing proportions, finished in rich-looking, 2-tone gray. And this counter features the Veeder-Root "Ease-Eye" Reading Line of six large figures, in large windows, standing out boldly against the contrasting band of light gray.

The new 1260 is designed so that it can be adapted to any of the standard counter drives: ratchet, revolution, direct, or geared, with shaft extending on either side. It will count faster than any standard counter, and is built to give the accuracy and long life you always get from all Veeder-Root Counters.

See how easily this New 1260 can be designed into *your* product . . .
how much it will add to your product's appearance and appeal.

VEEDER-ROOT INC.
HARTFORD 2, CONN.

In Canada: Veeder-Root of Canada, Ltd., 995 St. James St., Montreal 3. *In England:* Veeder-Root Ltd., Dickinson Works, 20 Purley Way, Croydon, Surrey

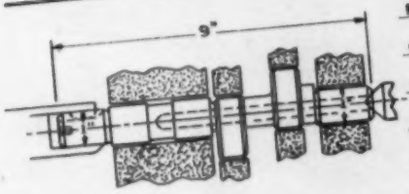
DETROIT PUBLIC LIBRARY

Low Cost Surface Finishing . .

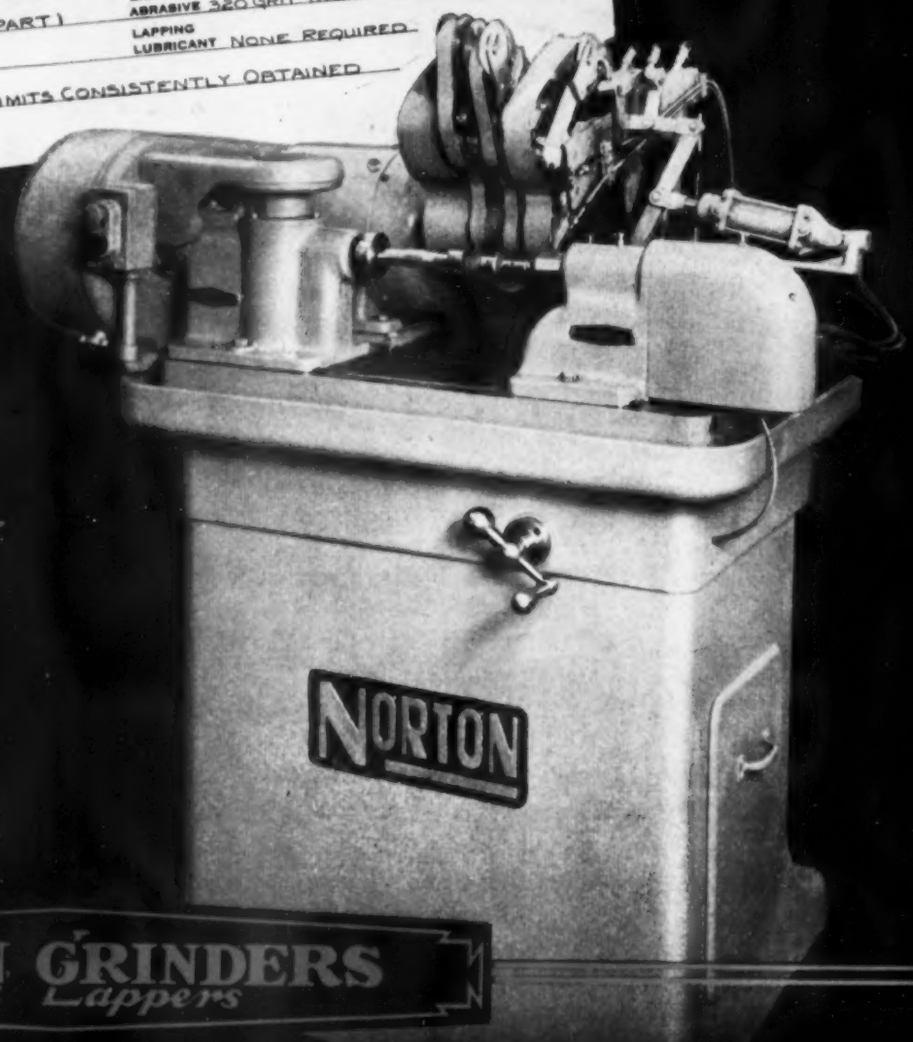
3-5 Micro Inches (RMS)! 100 Shafts per Hour!

Production Record Data — No. 1505

Norton Company, Grinding Machine Division, Worcester, Mass., U.S.A.



PART Compressor Shaft
OPERATION Surface Finish All Brgs (5)
MATERIAL Meehanite
PREVIOUS OP. Grind
STOCK REM. .0001 to .0002"
LIMITS ± .0002"
FINISH 3-5 Microinches (RMS)
PRODUCTION 100 Shafts / Hour
MACHINE #12 Simplex Surface Finisher
FIXTURES 4 Arms (#1 Arm Takes 2 Brgs)
LAPPING ABRASIVE 320 Grit Treated Abrasive Paper
LAPPING LUBRICANT None Required
PREVIOUS PROD. — (NEW PART)
OLD MACH.
REMARKS Finish And Limits Consistently Obtained



NORTON GRINDERS *and Lappers*

Abrasives - Grinding Wheels - Grinding and Lapping Machines - Refractories - Porous Mediums - Non-slip Floors - Norbide Products - Labeling Machines

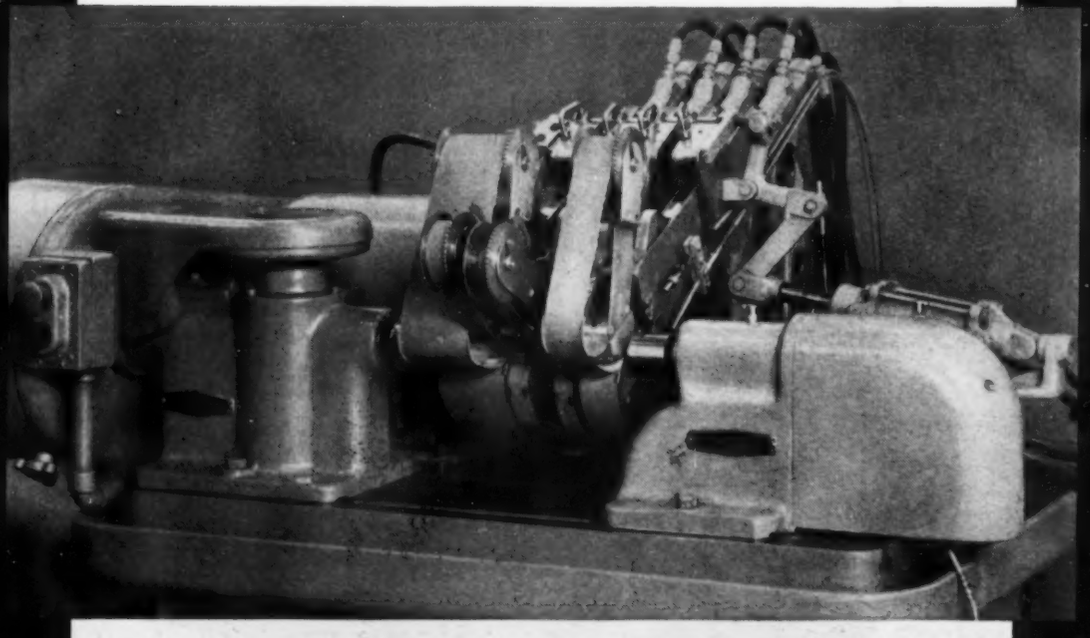
on the NORTON #12 SIMPLEX SURFACE FINISHING MACHINE

THE Norton #12 Simplex combines the highly desirable features of simplified, trouble-free design, and the ability to do an outstanding job. Here are some pertinent facts about this new NORTON machine:

- **Highly compact — very little floor space required.**
- **Handles work up to 12" in length.**
- **Pneumatically operated.**
- **A control valve automatically governs the loading and unloading cycle.**
- **Finishing cycle controlled by electric timer.**
- **Operation is by a single control lever, which the attendant merely turns.**
- **Uses a specially treated abrasive paper or cloth as the finishing medium.**
- **No coolant system required.**

Catalog #217-1 gives further details, write for a copy.

M-558



Closeup showing NORTON #12 Simplex Surface Finishing Machine with arms in operating position on a compressor shaft.

NORTON COMPANY, WORCESTER 6, MASS. · New York · Chicago · Detroit · Cleveland · Hartford · Distributors in All Principal Cities

THE AMERICAN TOOL WORKS CO.

THIS *SHOWS* IT BETTER THAN WE CAN *TELL* IT...

THIS IS one of those "high" jobs with the arm as high as it will go. But note that all control levers on the head are still within easy reach of the operator.

The value of the "American" Hole Wizard's concentrated control at the bottom of the head is clearly demonstrated by this job.

Note, also, how easy it is for the operator to make the speed changes for the different tools. Not only are the speed change levers within easy reach, but the speed change mechanism is direct reading so the operator can see how to get the speed he wants and get it quickly without fear of mistake.

Operators like "American" Hole Wizard Radials. Ask the man who runs one—see what he says. An operator gets more work from a machine he likes.

Descriptive Bulletin No. 327 tells the whole story. Want one?

Lathes and Radial Drills **Cincinnati, Ohio U.S.**

BALDWIN HYDRAULIC PRESSES

help accelerate panel production for Kaiser-Fleetwings, Inc.

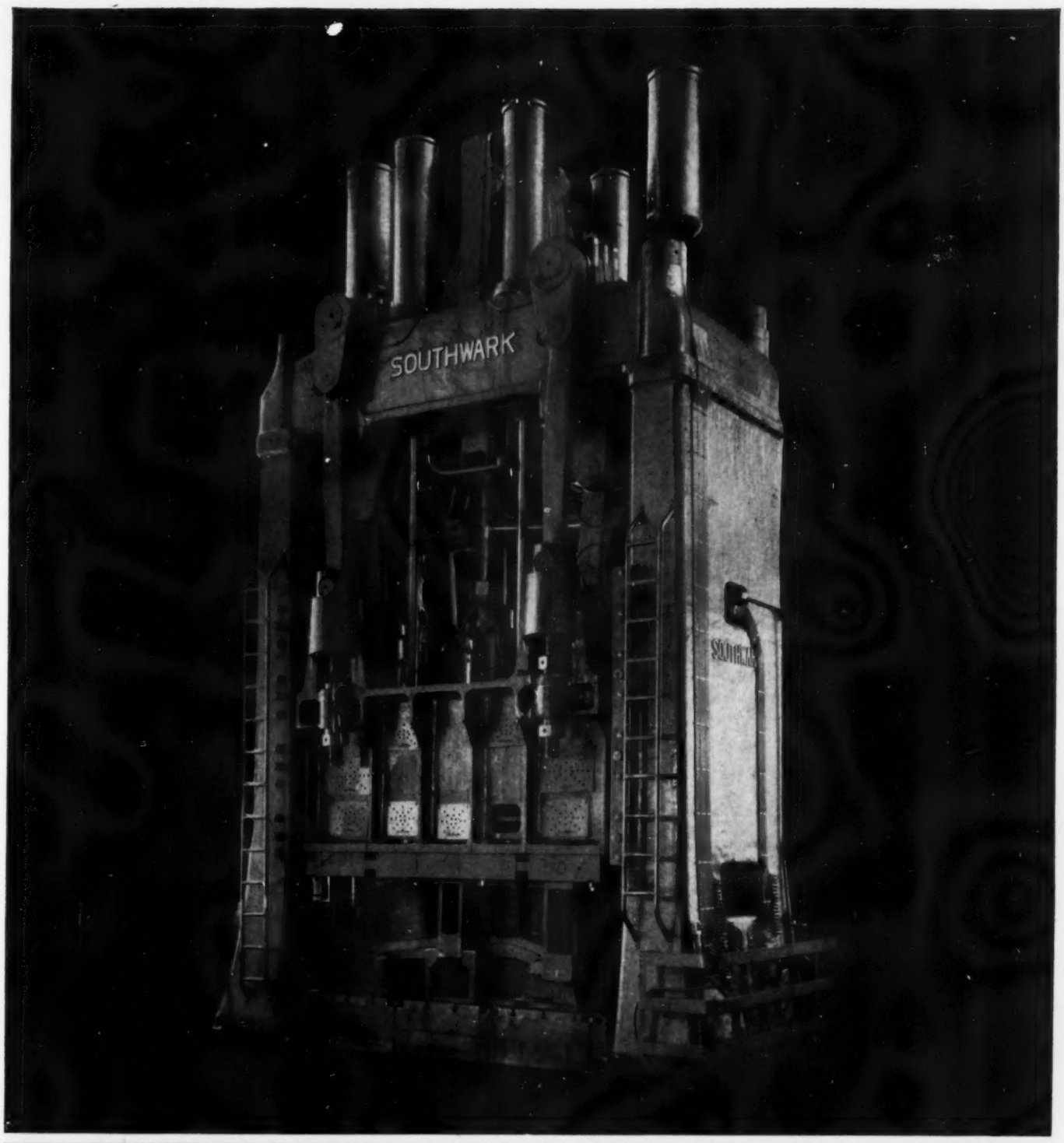
In the Kaiser-Fleetwings, Inc. Plant at Bristol, Pennsylvania, Baldwin presses are helping to solve today's big problem of cutting manufacturing costs.

The press illustrated is one of the Baldwin-Southwark units installed and operating. This triple-action press of 750-ton capacity is currently producing inner panels for Kaiser-Frazer deck lids. Outer panels are handled on a 2500-ton capacity unit.

With labor and material costs rising, the only real opportunity for holding the price line is through more efficient production. A Baldwin press can help you to turn out *more* products, with *fewer* rejects, at *lower* cost. The nearest District Office will give you full details.

Drawing of outer panels for the K-F deck lid is expedited on a Baldwin-Southwark Hydraulic Press of 2500-ton capacity. Press is served by a crew of two. Discharge side is shown; stamping is being removed after forming.

Drawing and trimming K-F deck lid inner panels on a 750-ton Baldwin-Southwark Triple-action Hydraulic Press. Both draw and trim dies are set up on the same press. The unit is served by a crew of four, two on each side. Here the finished stamping is removed, and discharged onto a gravity conveyor.



BALDWIN

HYDRAULIC PRESSES

The Baldwin Locomotive Works, Philadelphia 42, Pa., U. S. A.
Offices: Boston, New York, Philadelphia, Birmingham, Houston, St. Louis, Chicago, Cleveland, Pittsburgh, San Francisco, Seattle, Washington. In Canada: Baldwin Locomotive Works of Canada, Ltd.

NEW METHODS BRING "SPECIAL-MOTOR" SMOOTHNESS TO STANDARD MOTORS

Motors have been made in much the same way for many years, until Westinghouse—with many years of leadership in a-c motor developments—departed from "tradition" in electric motor concepts, and built the Life-Line.

Motor-making traditions have been broken by the basketful. Users were surveyed to find what they wanted in standard motors that they were not getting. Life-Line motors were designed and built from scratch—by new methods and new tools in a totally new plant—to include these features.

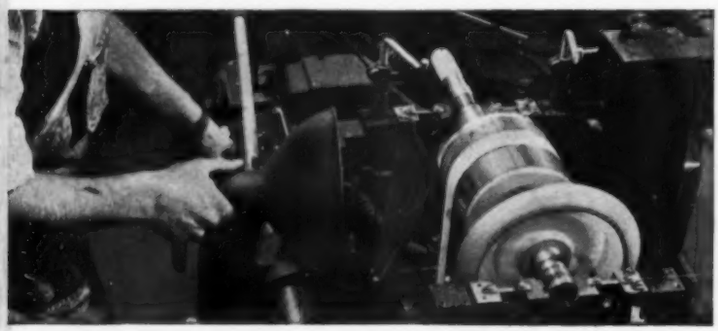
Quieter operation was one feature motor users asked for. It's important in many places—fans, blowers, air conditioning. Life-Line motors provide it. Life-Line ventilating design limits "windage" noise. New manufacturing techniques that insure absolute alignment and accuracy of fit, reduced vibration. The result is a *standard* motor with the quietness and freedom from vibration evidenced in the dramatic demonstration shown opposite. Modern tests check every motor for accuracy in manufacture.

You will want full details on other Life-Line features—its solid steel construction—freedom from lubrication for 5 years or longer—new compactness and light weight. Life-Line motors, now built in sizes from 1-15 hp, are available in standard and near-standard types from stock. Other sizes and types—up to 200 hp—will soon be changed over to modern Life-Line design. Check your nearest Westinghouse office for deliveries—or write Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pennsylvania. J-21457

Westinghouse
PLANTS IN 25 CITIES . . . OFFICES EVERYWHERE

Life-Line motors

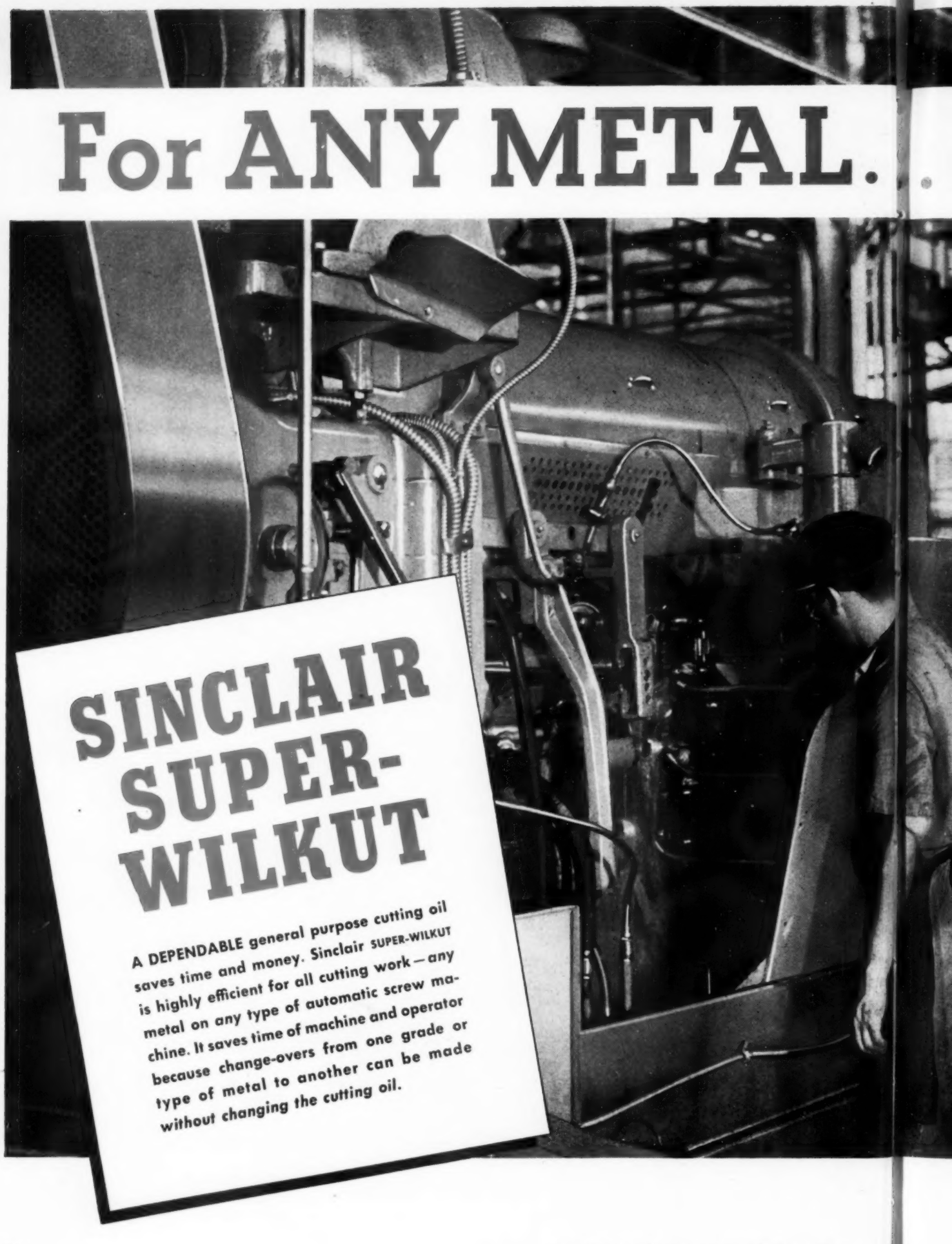
MEASURED—WITH AIR New extreme accuracy for checking diameters of shafts and bearing bores is made possible by this precision gauge. Size is checked by any variations in air stream escaping between the part being checked and the master gauge.



EVERY UNIT BALANCED. *Every* Life-Line rotor—not random samples—is balanced on a Dynetric balancing machine* to insure maximum possible freedom from vibration of every unit.
*Reg. U. S. Pat. Off.

MOTOR "ASTHMA" CHECK. Sounds that shouldn't be there don't get by this "noise detective". Audiometer tells noise wave length; sound level meter (left) checks decibel rating; sound analyzer (right) tells the relative amount of different frequencies resulting

Life-Line
SMOOTH? HERE'S PROOF! Coin balanced on edge on a Life-Line motor remains undisturbed as motor is started, runs and stops—dramatic evidence of Life-Line's freedom from vibration and resulting noise!


For ANY METAL...
SINCLAIR SUPER-WILKUT
A DEPENDABLE general purpose cutting oil saves time and money. Sinclair SUPER-WILKUT is highly efficient for all cutting work—any metal on any type of automatic screw machine. It saves time of machine and operator because change-overs from one grade or type of metal to another can be made without changing the cutting oil.

. . or Any Automatic

Sinclair SUPER-WILKUT is a sulphurized cutting oil, *but*, unlike the usual sulphurized oils, it can be used with equally satisfactory results on both ferrous and *non-ferrous* metals. SUPER-WILKUT is specially compounded to be *non-staining* and *non-corrosive*, making it particularly suitable for automatics with bronze bearings.

Sinclair SUPER-WILKUT is highly efficient both in dissipating heat from the work piece and, most important, in preventing excessive heat that tends to change dimensions of finished units and cause welding of fine chips to the cutting tool. This is proved by the successful use of SUPER-WILKUT on operations involving cemented carbide tools where recommended water emulsions proved unsatisfactory.

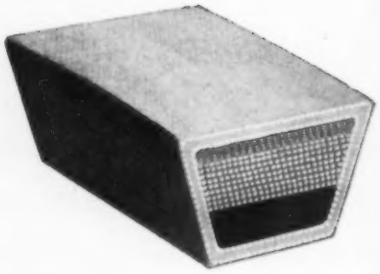
Let SUPER-WILKUT help solve problems in your machining operations.

SINCLAIR

INDUSTRIAL OILS

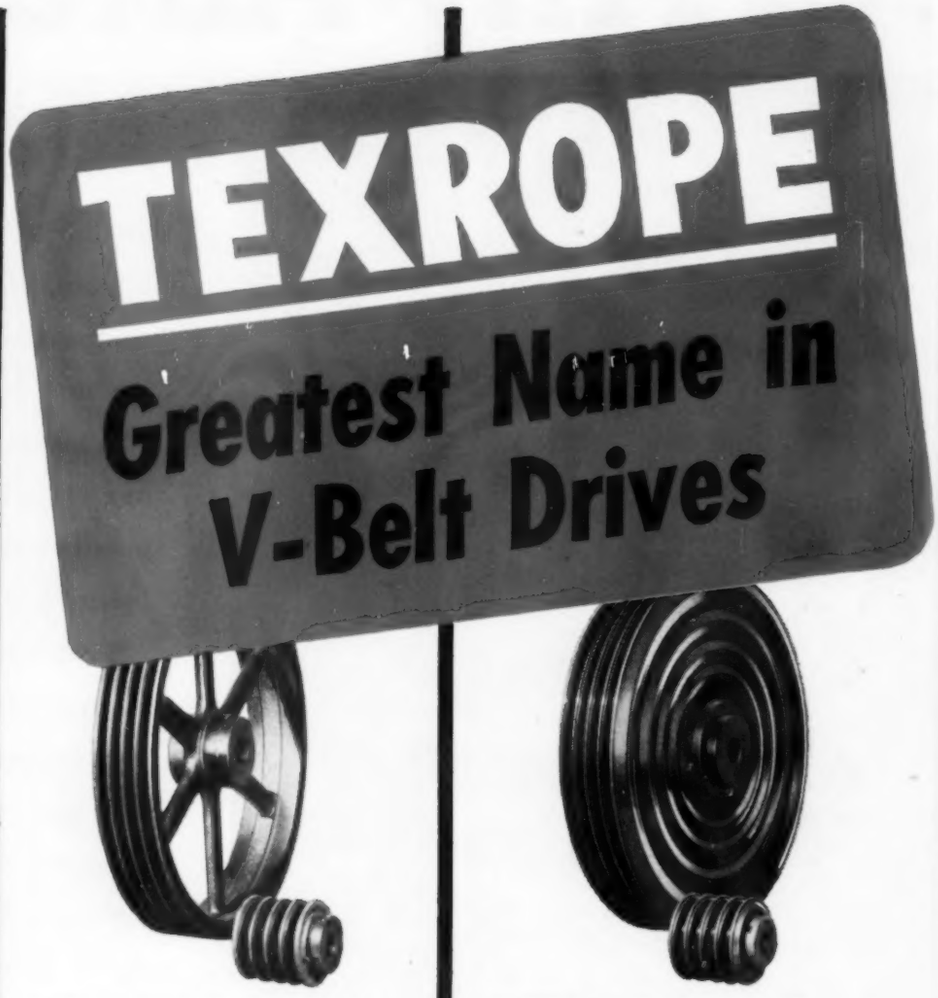
YOUR NEAREST SINCLAIR AGENT WILL GLADLY ARRANGE
FOR LUBRICATION COUNSEL, OR YOU MAY WRITE TO
SINCLAIR REFINING COMPANY, 630 FIFTH AVENUE, NEW YORK 20, N. Y.

Fills Every Need



***TEXROPE* SUPER-7 V-BELTS** — All sizes and sections in fractional hp, standard, and wide range. Types to suit all operating conditions. Rayon cord and steel cable construction available for special applications. *All standard sizes available from stock.*

***TEX-IRON* SHEAVES**—Light weight cast iron sheaves for fractional and low horsepower use. Single groove only. Bored integral hub. Fine grain cast iron. Precision machined. Finest low-cost sheave. *All sizes available from stock.*



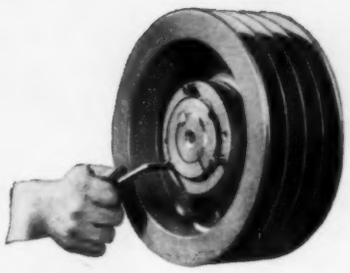
***TEXDRIVE* SHEAVES** — Sturdy cast iron sheaves for 1 to 25 horsepower applications. 1 to 6 grooves for A and B belts. Light but strong. Best all-purpose cast iron sheave. *All sizes and bores from stock.*

TEXSTEEL SHEAVES — Pressed steel sheaves for applications from ¼ to 25 horsepower. Light weight and rigid. Rolled edges. 1 to 6 grooves, A or B belts. *All sizes and bores available from stock.*

BEST DELIVERY IN THE INDUSTRY!

FINEST ENGINEERING TALENT!

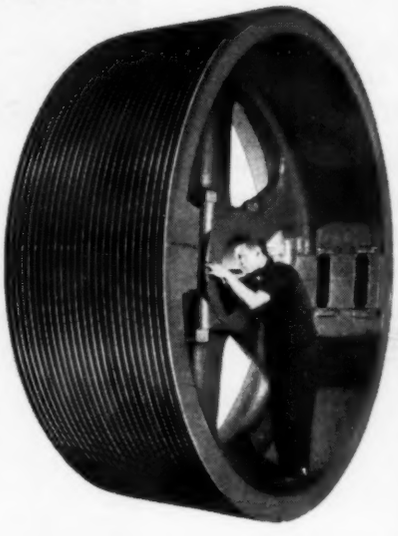
for V-Belt Drives!



***MAGIC-GRIP* SHEAVES** — Semi-steel casting with interchangeable, patented taper bushings. On and off in a jiffy. Cannot shake loose. 2 to 12 grooves for B, C and D belts. 2 to 250 horsepower. *All sizes available from stock.*

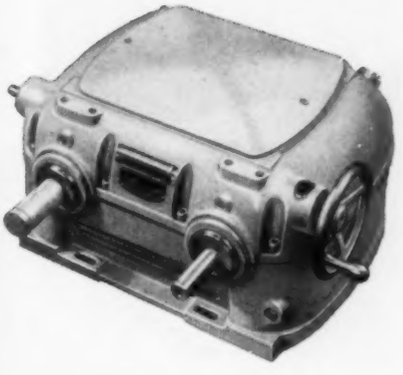
***VARI-PITCH* STANDARD SHEAVES** — Speed range of 9% to 28% on drives of 1 to 300 horsepower, using A, B, C, D, or E belts. 2 to 10 grooves. Available with Motion Control or Stationary Control. Good delivery. *Check your Texrope dealer or A-C Office.*

***VARI-PITCH* WIDE RANGE SHEAVES** — Speed range up to 100%. 1 to 4 grooves, Q and R belts. Fractional to 30 horsepower. Stationary and Motion Control. Good delivery. *Check your dealer or A-C Office.*



STANDARD CAST IRON SHEAVES — Made to order from stock patterns. 1 to 14 grooves for A, B, C, D, or E belts. 1 to 1000 horsepower. Split sheave or split hub. Good delivery. *Check your Texrope dealer or A-C District Office.*

SPECIAL CAST IRON AND STEEL SHEAVES — Any number of grooves, A, B, C, D, or E belts. Engineered for applications up to 6000 horsepower. Foundry and machine shops equipped to handle work of any size. Good delivery. *Check your Texrope dealer or A-C District Office.*



***VARI-PITCH* SPEED CHANGERS** — Wide Range Vari-Pitch sheaves controlled by single handwheel. Capacity: 1½ to 75 horsepower. 375% speed range. For quick speed changes and close control. Good delivery. *Check your Texrope dealer or A-C Office.*

NOW YOU CAN GET nearly every standard V-belt drive component from Texrope stocks. Even on non-stock items, Texrope delivery is the best in the industry. And Texrope is the *only* brand that meets every V-belt need. Whatever you need in V-belt drives, call your Texrope dealer or A-C Office.

World's greatest store of V-belt engineering knowledge has been condensed into the 144 page Texrope Pre-Engineered Drive book. Covers 90% of all V-belt drive requirements. Makes selection easy as looking up a telephone number. Write for Bulletin 20 B 6956 or see your A-C Dealer or District Office.

ALLIS-CHALMERS, 999A SO. 70 ST. A 2547
MILWAUKEE, WIS.

Texrope, Super-7, Vari-Pitch, Magic-Grip, Tex-Iron, Tex-steel and Texdrive are Allis-Chalmers Trademarks.

Texrope Super-7 V-belts result from the cooperative research of Allis-Chalmers and B. F. Goodrich; and are sold only by A-C dealers and offices.

ALLIS-CHALMERS

Originators of the Multiple V-belt Drive for Industry

32 ALUNDUM®

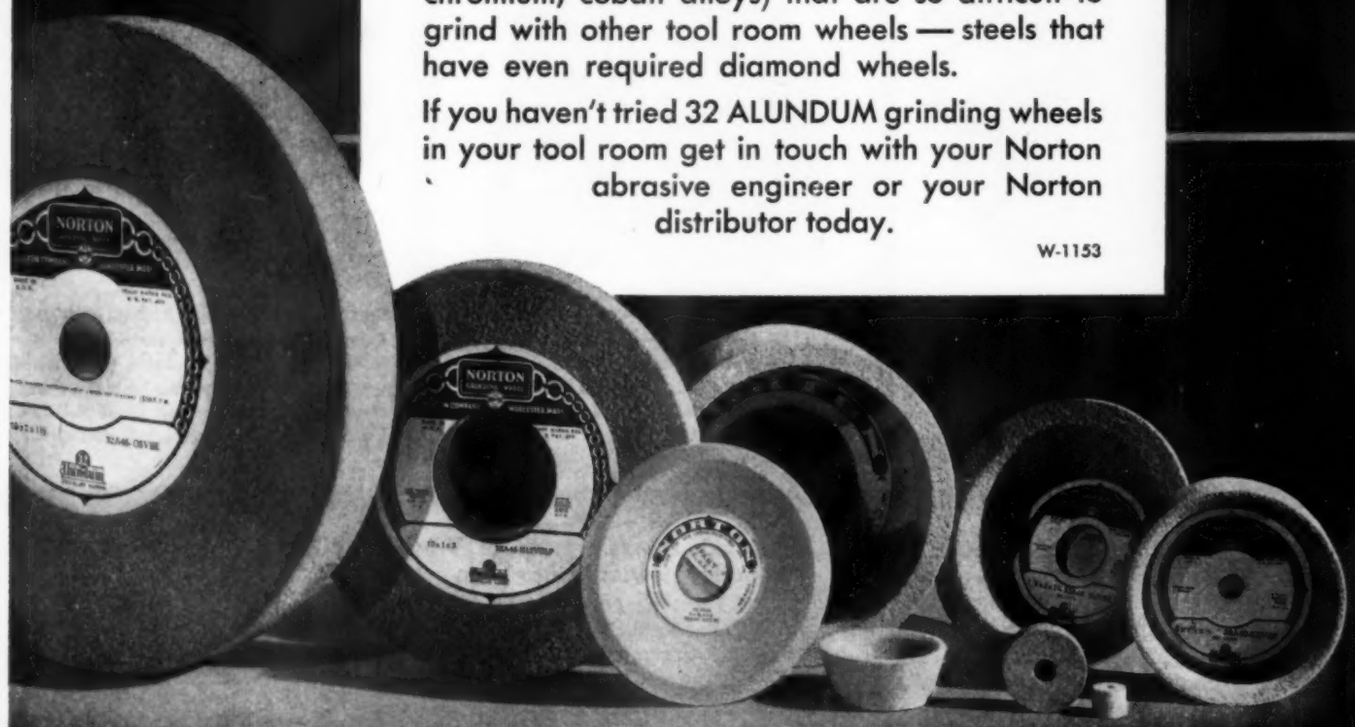
Fast Cutting . . . Cool Cutting
Few Dressings . . . Long Life

32 ALUNDUM abrasive gives you these four features in a far greater degree *than any other abrasive* — because it's made differently by a Norton-developed and patented process. Its unique single-crystal grains are *sharper* — they penetrate hard, tough high speed steels more easily — cut faster and cooler.

32 ALUNDUM wheels, for example, will grind the new "super" high speed steels (tungsten, chromium, cobalt alloys) that are so difficult to grind with other tool room wheels — steels that have even required diamond wheels.

If you haven't tried 32 ALUNDUM grinding wheels in your tool room get in touch with your Norton abrasive engineer or your Norton distributor today.

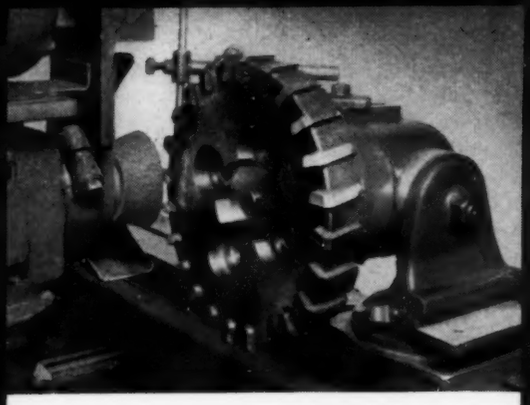
W-1153



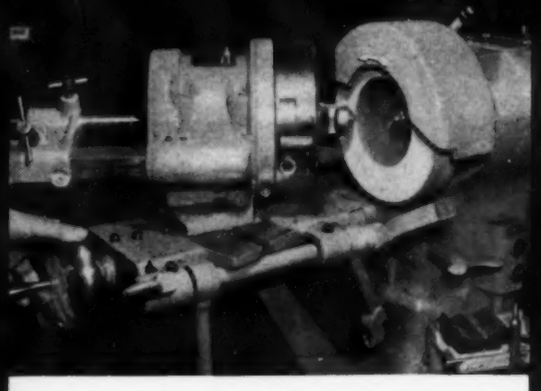
NORTON ABRASIVES

Abrasives - Grinding Wheels - Grinding and Lapping Machines - Refractories - Porous Mediums - Non-slip Floors - Norbide Products - Labeling Machines

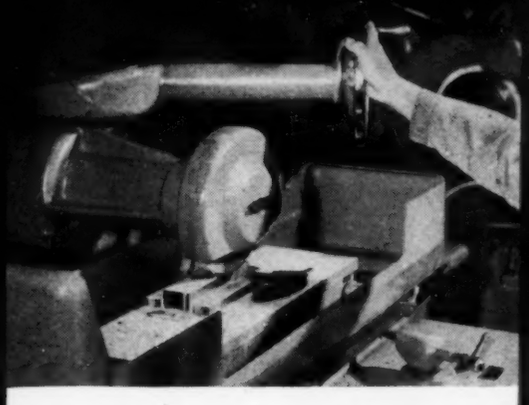
. . . Outstanding for TOOL ROOM GRINDING!



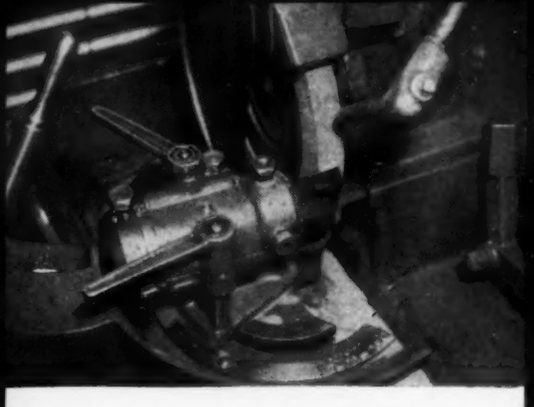
Because they stay sharp without frequent truing "32" wheels are ideal for multi-tooth cutters — will hold size all the way around without burning. Suggested specification: 32A46-K5VBE.



The cool cutting action of "32" prevents burning of sensitive H. S. S. drills and its versatility simplifies the grinding of a variety of sizes. Suggested specification for medium and large drills: 32A46-M5VBE.



"32" wheels give the extreme precision necessary for tool room surfacing jobs and they give it faster — with feeds several times greater than you've done before. Suggested specifications: 32A46-H8VBE or 32A60-F12VBEP.



You'll find "32" wheels the fastest cutting you've ever used for single point tools — whether you sharpen offhand or by machine. Suggested specifications: offhand 32A30-05VBE (roughing), 32A60-M5VBE (finishing); machine 32A36-L5VBE.

NORTON COMPANY, WORCESTER 6, MASS. *Distributors in All Principal Cities*

FURTHER PRODUCTION *increases*

with new BARBER-COLMAN "*MULTITHREAD*" Hobs

Where machine conditions are right, and tolerances are adaptable, Barber-Colman "*Multithread*" Hobs offer further increases in gear output from your existing hobbing machines.

For example, the job illustrated below was reduced from two operations to one cut by using "*Multithreads*". The machine's capacity for these large diameter hobs brought floor-to-floor production time down to 3.1 minutes per gear.

Best results with these hobs have been obtained on semi-finished gears, although they are used in some cases for finishing. The use of these hobs depends largely upon machine conditions, the amount of stock to be left for finishing and the characteristics of the particular gears to be cut.

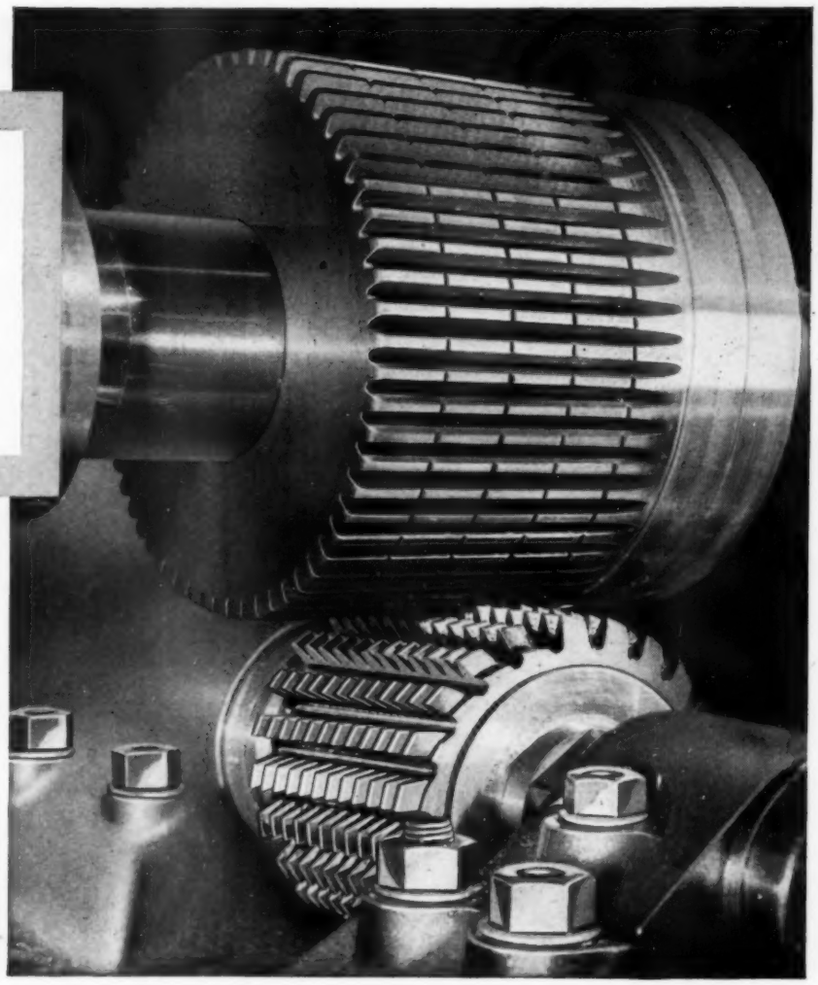
We are anxious to demonstrate what these new hobs will do, and we invite your questions and job requirements. Only on the basis of a comprehensive analysis of your job can we estimate accurately the possibilities for improvement with "*Multithreads*"

Barber-Colman Company

GENERAL OFFICES AND PLANT 118 LOOMIS ST., ROCKFORD, ILLINOIS, U.S.A.

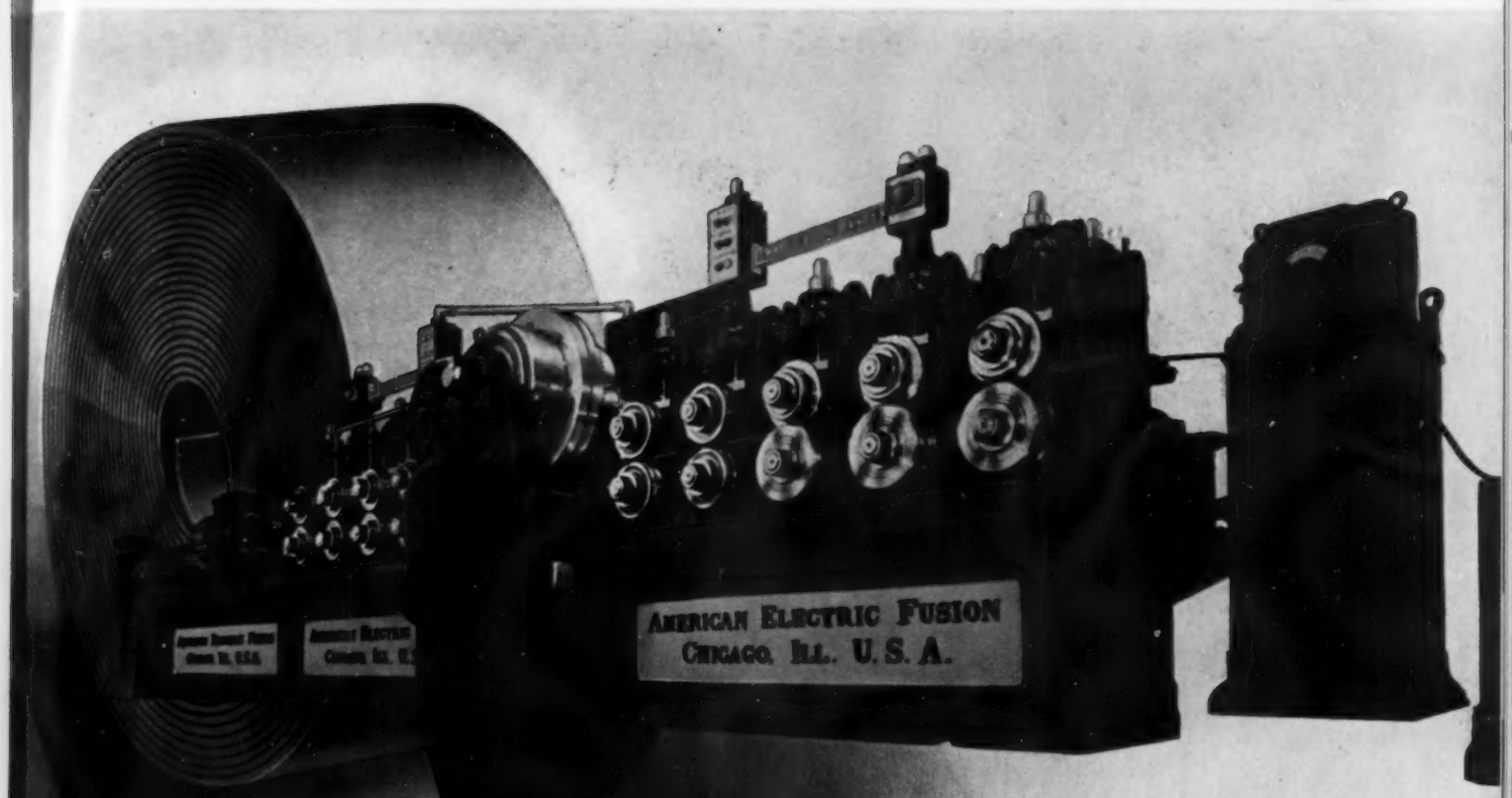
JOB FACTS

Operation — Climb Hob Precision Change Gears
Machine—Barber-Colman No. 14-15
Hob—Barber-Colman Ground "*Multithread*" Hobs
Material—NE 8949, 30-34 R.C.
Feed—.150″/rev. Speed—91 SFM
Floor-to-Floor Time—21.8 min. per load of 7
Hob Life—150 gears per sharpening
Accuracy—Adjacent spacing .0003″/.0005″



BARBER COLMAN — MODERN MACHINES DEMAND *Modern* CUTTING TOOLS

For Lowest Cost Steel Tubing



Automatically converts strip steel, including stainless, to perfectly welded tubing or pipe at high speeds. The most economical tube manufacturing unit available, an A.E.F. Tube Mill will pay for itself in less than a year.

Roll Your Own on

A.E.F.
ELECTROWELD TUBE MILLS

Mechanical tubing and standard weight pipe for the Automotive, Marine, Railroad, Home Appliance, Electrical, Furniture, Machinery, Petroleum, Food, Chemical, Construction and Other Industries.

AMERICAN ELECTRIC FUSION CORPORATION

2602 DIVERSEY AVENUE • CHICAGO 47, ILLINOIS

The Heart of the A.E.F. TUBE MILL

THE EXCLUSIVE A.E.F. WELDING UNIT WHICH WELDS A GIVEN THICKNESS WITH UP TO 50% LESS KVA DEMAND THAN ORDINARY TUBE WELDERS

Dependable A.E.F. Welding Units will produce perfect welding at lower operating cost than is possible with conventional tube welders. The A.E.F. patented design rotary transformer eliminates current-consuming long leads, operates at electrical efficiency of over 90%. The unique system of oil-cooling is another feature that makes possible 24-hour-per-day operation and eliminates entirely the danger of transformer failure. The Welding Unit is mounted on ball bearings and is rotated by the friction on the tube. It automatically adjusts itself to the speed of forming without any slippage.

For long, uninterrupted service, low power consumption, economy, efficiency, and above all, quality of weld, there is nothing else comparable. Take the first step toward cutting your tubing costs. Write for descriptive catalog.

1. 60 KVA LIGHT WALL MILL produces tubing with wall thickness from .025″ to .093″ and outside diameters from ¼″ to 2½″; with slight modification at factory, limits can be extended to make tubing up to 3″ O.D.

2. 170 KVA MEDIUM WALL MILL produces American standard weight pipe from ½″ to 2″, as well as mechanical tubing up to 4″ O.D. with maximum wall thickness of .156″.

3. A.E.F. HEAVY WALL MILL produces tubing up to 6″ O.D. Detailed information on request.

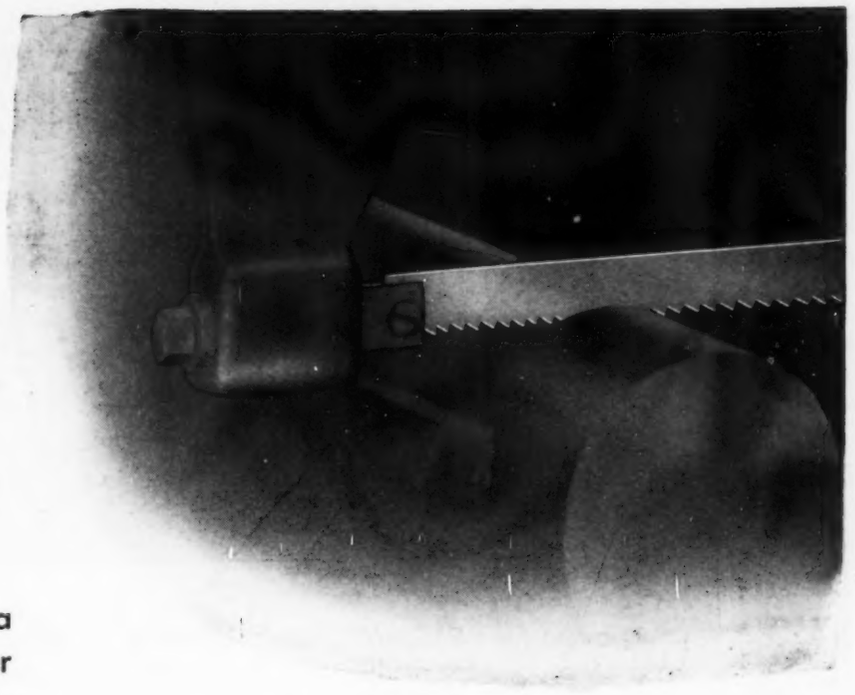
A.E.F.

AMERICAN ELECTRIC FUSION CORPORATION

2602 DIVERSEY AVENUE • CHICAGO 47, ILLINOIS

Which is better for you...

A Hack Saw, or a Band Saw?



Only MARVEL can give a strictly impartial answer for only MARVEL manufactures *both* hack sawing machines and metal cutting band sawing machines, and manufactures *both* hack saw blades and metal cutting band saw blades. For this reason, your local MARVEL Sawing Engineer is best qualified to analyze your particular metal-sawing or cutting-off problems and recommend, without bias, the type sawing machine and correct blade to do your work most efficiently.

MARVEL recommendations are based on actual operational laboratory and field tests covering *cutting-off time and costs* for bars, tubes, and shapes on all types of sawing machines and with various blades. (It is significant that time factors of various so-called "fast" machines vary as much as 4 to 1 on many operations, while costs differ as much as 6 to 1.)

•

Write for new catalog C48, and if you feel that our field service engineer may be helpful to you, let us know.

•

ARMSTRONG-BLUM MFG. CO.

"The Hack Saw People"

5700 BLOOMINGDALE AVE. CHICAGO 39, U.S.A.

MARVEL *Metal Cutting* SAWS

Better Machines–Better Blades

new Bullard type "K" economies widen scope of MULT-AU-MATIC method

HIGHER SPEEDS, FASTER INDEXING, EASIER CHUCKING REDUCE TIME ON AND BETWEEN CUTS

Demand for a BULLARD Mult-Au-Matic capable of lowering production costs of small and medium sized jobs in cast iron, steel and light metal alloys such as aluminum and magnesium is now met by the addition of the new Type "K" to this versatile line of cost-saving machines.

Higher Speeds Meet New Job Requirements. Providing spindle speeds up to 900 rpm, the new Type "K" gets full productive capacity out of modern cutting tools. The wide range of available spindle speeds makes it adaptable for machining many different kinds of materials in sizes within its chucking capacity.

Saves Time Between Cuts. A newly developed index control mechanism permits faster return and advance of tool carrying heads and faster carrier index, materially reducing lost time between cuts.

Higher Degree of Accuracy. New method of carrier index registry insures maintenance of repetitive accuracy from station to station. This results in producing work to close tolerances in keeping with present-day requirements.

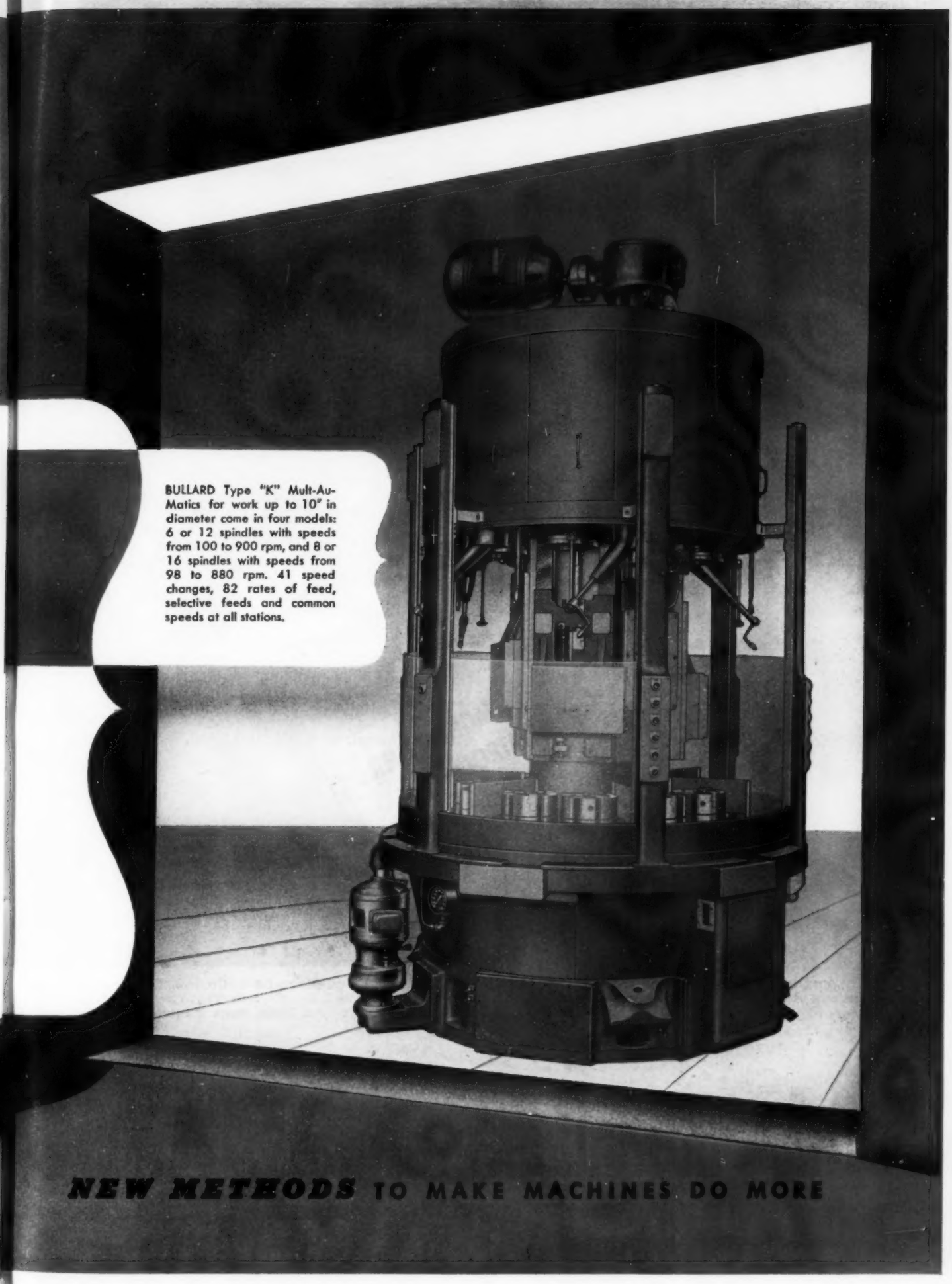
Improved Hydraulic Chucking Increases Efficiency. Work is chucked quickly by means of a foot treadle control and is automatically released when spindles are returned to loading station. Chucking pressure may be regulated to suit work characteristics.

Twin Spindles Double Production. To the four economies just described, common to all *four* Type "K" models, the twin-spindle models add the extra advantage of delivering two finished pieces for every index cycle. This promise of lower production cost is worth investigating further.

Many other advantages are inherent in the new Type "K" version of the Mult-Au-Matic method, one of the leading contributors to our modern American production system. Write for complete information. THE BULLARD COMPANY, Bridgeport 2, Connecticut.

BULLARD

BULLARD CREATES



BULLARD Type "K" Mult-Au-Matics for work up to 10" in diameter come in four models: 6 or 12 spindles with speeds from 100 to 900 rpm, and 8 or 16 spindles with speeds from 98 to 880 rpm. 41 speed changes, 82 rates of feed, selective feeds and common speeds at all stations.

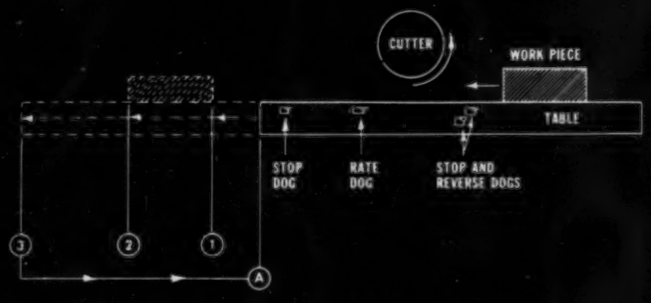
NEW METHODS TO MAKE MACHINES DO MORE

Is it any wonder operators like Kearney & Trecker Milling Machines with the new Automatic Table Cycle and *Mono-Lever* Control? See how this operator stands—erect and relaxed with one hand resting on the *Mono-Lever* Control. There's no bending over—no fussing with a lot of levers. That means less fatigue for him—less idle cutter time, faster, more accurate results for you!

New Idea in Milling Practice MAKES WORK . . . REDUCES

HOW JOB IS DONE

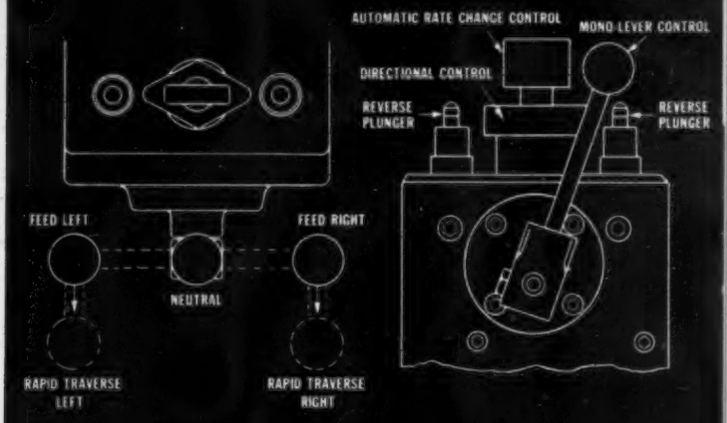
USING AUTOMATIC TABLE CYCLE AND MONO-LEVER CONTROL



1. Operator loads work and engages rapid traverse with Mono-Lever control.
2. Pre-set feed dog changes rapid traverse to feed at point of entering cut.
3. Pre-set stop and reverse dogs engage at end of cut. Table reverses to starting point (A) and stops. Operator reloads and repeats cycle.

HOW IT WORKS

AUTOMATIC TABLE CYCLE and MONO-LEVER CONTROL UNIT



PRACTICAL WORK like the job shown at left and diagrammed above, prove 16% saving floor-to-floor time on small lot production (10 or less pieces.) Note operator engages *Mono-Lever* control only *once* — Time to pre-set dogs? *22 sec.*

THINK OF IT! Now you can have all the advantages of this great cost-cutting feature plus the all-around versatility of general purpose, knee-type machines . . . faster, easier control for greater production with less operator fatigue.

KEARNEY & TRECKER research and development — always directed at greater production and lower costs — scores again! This time it's knee type milling machines with Automatic Table Cycle and *Mono-Lever* control.

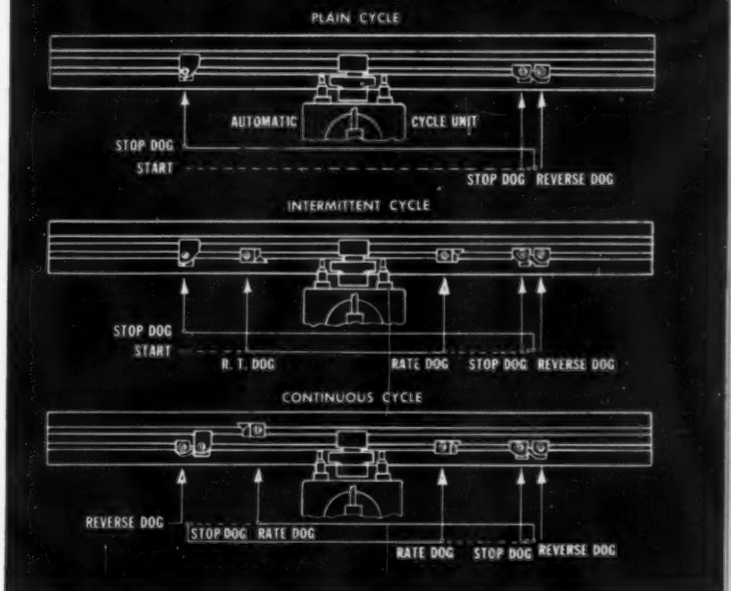
This new machine feature offers savings of at least 16% and up to 31% — and more in floor-to-floor time on nearly every job. That means they return your investment *faster than any other standard machines* for general milling work.

Of equal importance to you is the opportunity for proper machine selection. You neither *over-buy* nor *under-buy*, but you buy *right* when you choose from the *56* machines in this new Kearney & Trecker line.

For some startling facts about these machines and their application to your milling work, consult a Kearney & Trecker Sales Representative today. He's been schooled in the "know-how" and he's at your service. For detailed information, contact him or write us direct. Ask for Catalog No. AC-10A. Kearney & Trecker Corp., 6784 W. National Ave., Milwaukee 14, Wis.

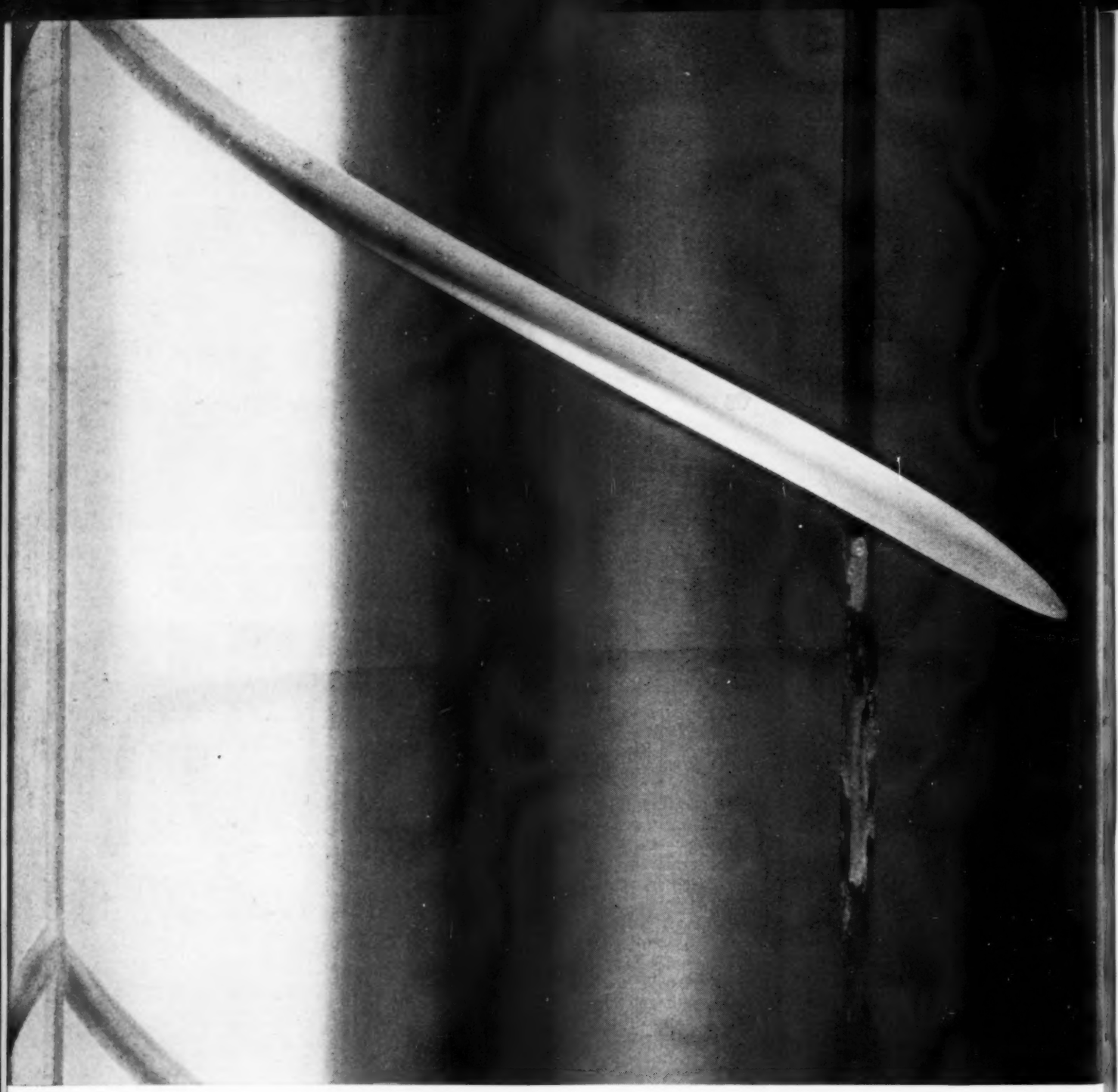
KEARNEY & TRECKER MILWAUKEE MACHINE TOOLS

TYPICAL CYCLES YOU CAN USE



THREE DIFFERENT TYPICAL CYCLES to accommodate various job setups. Using the completely automatic cycle feature effects savings of up to 31% for lots of 10 or more pieces. Cycle can be set for loading and unloading time — and can be reversed in feed or rapid traverse.

THE MACHINE DO MORE
CYCLE TIME UP TO 31%



SUPERFINISH...

modern preventive for metal "skin wounds"!

This *unretouched* enlargement shows the surface of a spindle quill—ground and chrome plated. It was scored and damaged as the machine was jarred in shipment. Had the part been Superfinished *before* plating, the soft underlying "smear metal" caused by grinding heat would have been removed, leaving a hard surface far less susceptible to such "skin wounds."

Superfinishing is a real economy wherever maximum bearing life is desired. If you don't have the textbook, "Wear and Surface Finish," request it on your company letterhead.

GISHOLT MACHINE COMPANY
Madison 10, Wis.

THE GISHOLT ROUND TABLE

represents the collective experience of specialists in machining, surface-finishing and balancing of round and partly round parts. Your problems are welcomed here.

TURRET LATHES • AUTOMATIC LATHES • SUPERFINISHERS • BALANCERS • SPECIAL MACHINES

TURN THEM OUT *FAST*, AT *LOW* COST

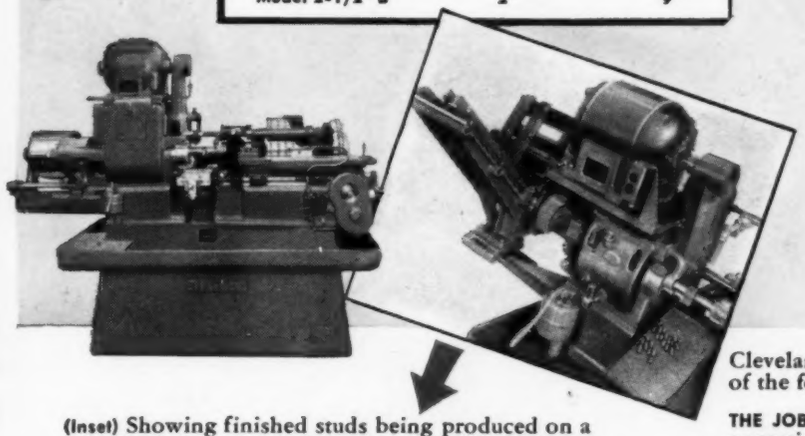
(A wide variety of materials, diameters, lengths, threads can be machined)

on these versatile CLEVELAND Automatics

CLEVELAND MODEL B
SINGLE SPINDLE AUTOMATICS

The ideal machine for solving stud problems. Handles a wide variety of diameters and lengths, and offers the user several different methods of production. First operation performed either on bar stock, or first and second operations performed on pieces cut to length and automatically loaded from vertical hopper magazines.

MAXIMUM MACHINE CAPACITY FOR STUD PRODUCTION		
Machine Size	**Diameter**	**Length**
Model 1-1/16" B	3/4"	8"
Model 2-1/2" B	2"	9"



(Inset) Showing finished studs being produced on a Cleveland 1-1/16" Model B recently delivered to a prominent manufacturer of automotive equipment. This machine is cammed to produce studs of the following sizes: 7/16", 3/8", 1/2", 9/16", 5/8" and 3/4".

THE JOB: 7/16" Stud from 3135 cold rolled steel. Blanks cut to length and pointed before being fed into machine.

1st OPERATION: Stud blanks fed through spindle from vertical hopper magazine and gauged from Rear Slide. Milling Slide cuts 7/16-14 thread, and pieces are ejected. 900 PIECES PER HOUR GROSS.

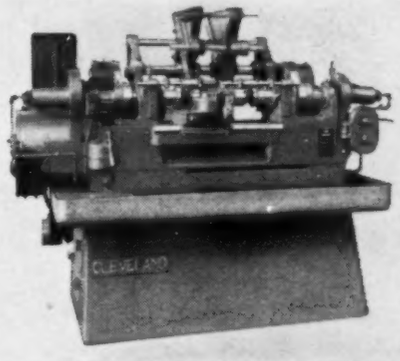
2nd OPERATION: (Same as 1st operation) Milling Slide cuts 7/16-20 thread, and pieces are ejected. 550 PIECES PER HOUR GROSS.

CLEVELAND MODEL J
DOUBLE-END AUTOMATICS

High speed magazine-loading machine capable of handling a wide range of special production involving work at both ends of the piece. Particularly suited for double-end threading of studs.

MAXIMUM MACHINE CAPACITY FOR STUD PRODUCTION		
Machine Size	**Diameter**	**Length**
Model J-1"	1"	11"
Model J-2"	1-1/2"	14"

Also longer lengths available on special order



Cleveland Model J-1" Automatic, cammed to produce studs of the following sizes: 7/16", 1/2", 9/16" and 5/8".

THE JOB: 7/16" Stud. Pieces cut to 4-1/8" length (as 1st operation on Cleveland 1-1/16" Model B) fed from hopper magazine to center gripping chuck. Two spindles carrying self-opening die heads cut 14 P thread 1" in length on both ends. 890 PIECES PER HOUR GROSS.

Whatever the job, if it calls for quality production at high speeds, there are Clevelands for automatic turning and forming of bar or tube stock sizes from 1/4" to 9-1/2", including multiple turning and forming of shafts and spindles up to 24" in length. Write for bulletins describing Clevelands suited to your production. Better still, get a Cleveland proposal on your next production job.

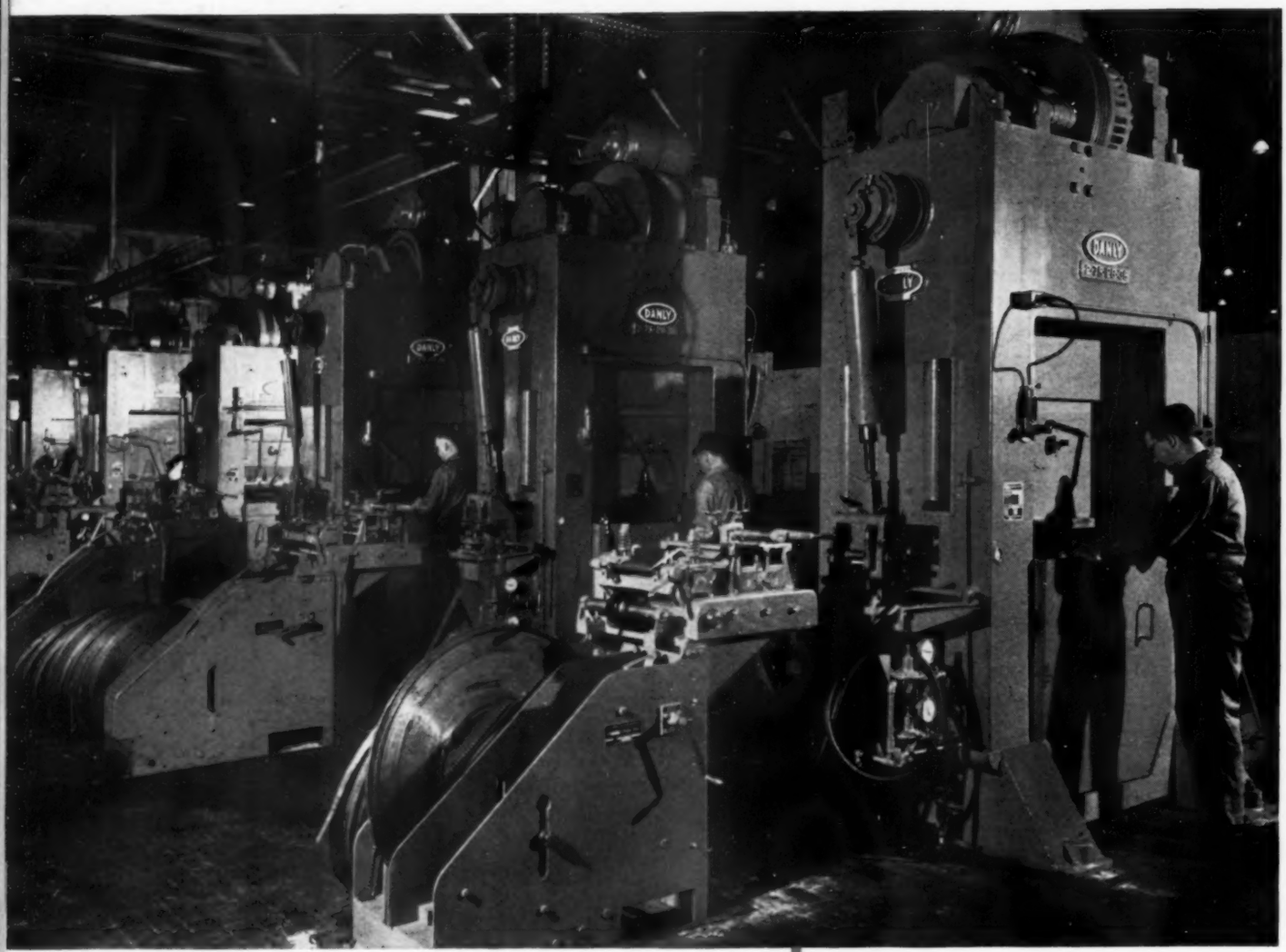
Remember, *Clevelands Cut Costs*

THE CLEVELAND AUTOMATIC MACHINE COMPANY

4928 BEECH STREET • • CINCINNATI 12, OHIO

CHICAGO (6) 3710 Civic Opera Bldg. CLEVELAND (14) 1114 NBC Bldg. DETROIT (2) 540 New Center Bldg.
HARTFORD (1) 529 Capital National Bank Bldg. NEW YORK (6) 2402 Singer Bldg.

CONTINUOUS CHAIN MADE with DANLY PRESSES



View at Chain Belt Company, Milwaukee, Wis., showing battery of Danly Two-Point 75-Ton High Production Presses equipped with automatic roll feed and chain spool producing continuous chain automatically.

JOB FACTS

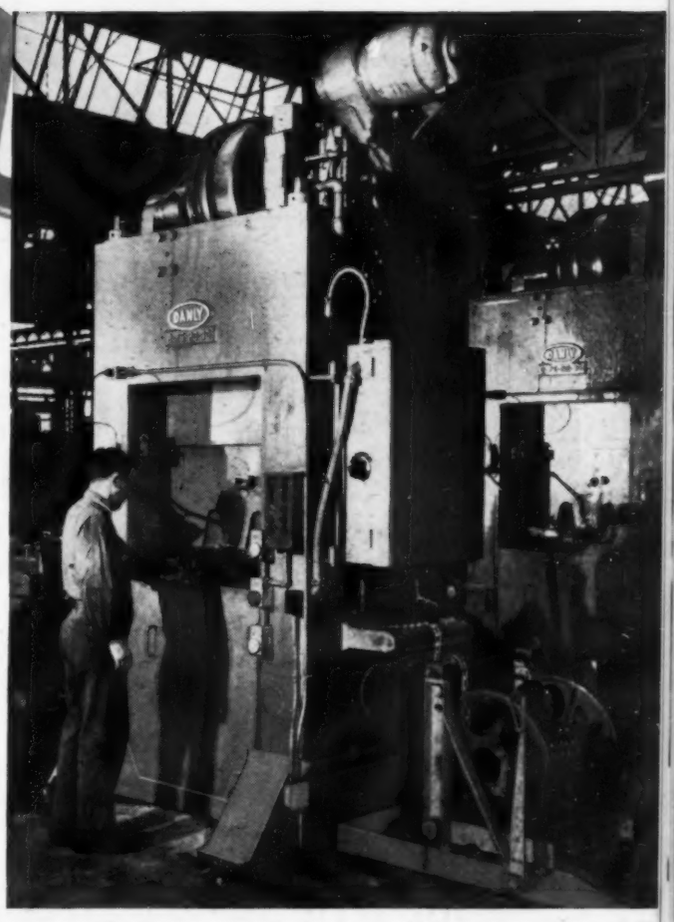
Press: Danly, 75-Ton Capacity.
Part Name: Steel Detachable Chain.
Job: Stamping, Forming, Complete Chain, 7.4 links per foot.
Material: Steel Strip—.105" x 1 7/32".
Die Sets: Danly Standard Die Sets. Progressive Dies.
Rate of Operation: Complete Link Per Stroke, per machine.
Auxiliary Equipment: Automatic Feed and Automatic Spool Winder for Completed Chain.

DANLY

PRECISION DIE SETS...STANDARD AND SPECIAL

AUTOMATICALLY FROM COIL

EQUIPPED WITH AUTOMATIC ROLL FEED AND CHAIN SPOOL

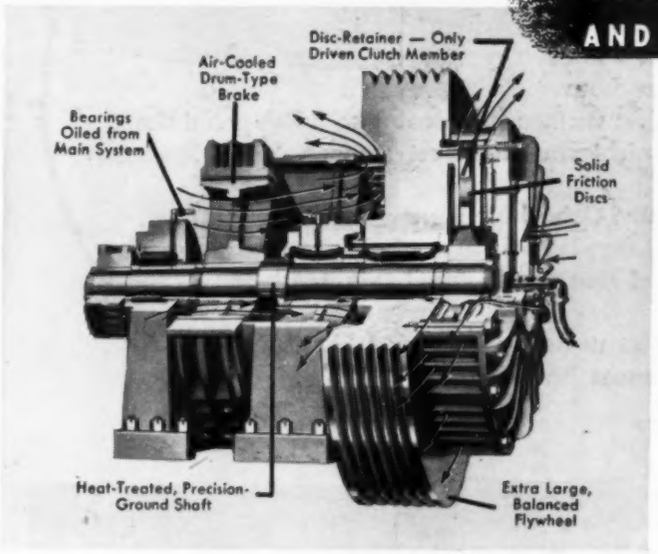


At Chain Belt Co. continuous steel detachable chain is manufactured complete on each of these Danly presses at the rate of a link per stroke. Operations consist of blanking, piercing, forming, and assembling the chain from steel coil stock which is fed automatically.

PRESSES GIVE LONG TROUBLE-FREE SERVICE

The resulting low manufacturing cost of this high speed operation is not the only economy effected. Extra savings accrue because the presses are designed to stay on the job longer, eliminating expensive down-time. For example, the frames of Danly presses are extra-heavy, welded steel construction, which are fully stress-relieved before machining. This assures continued alignment and a minimum of bed deflection—*no more than .0006" per foot of bolster width.* In turn, accuracy of die alignment is maintained which gives more stampings per die grind and longer die life.

Further, long trouble-free operation is assured by the Danly automatic filtered oiling system. Clean, filtered oil is piped directly to each gear, bearing, and driving member—*including the flywheel bearings.*


Disc-Retainer — Only Driven Clutch Member
Air-Cooled Drum-Type Brake
Bearings Oiled from Main System
Solid Friction Discs
Heat-Treated, Precision-Ground Shaft
Extra Large, Balanced Flywheel

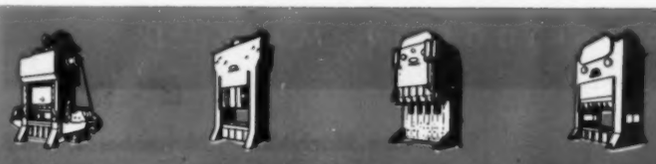
DANLY VENTILATED CLUTCH CUTS DOWN-TIME AND PRESS MAINTENANCE COSTS

The new Danly Ventilated Clutch is another exclusive feature that offers unusual advantages in reducing press down-time and maintenance costs. High velocity air ventilation eliminates over-heating. The drive shaft, gears and bearings are fully lubricated automatically. *Test runs under full load show negligible disc wear after more than 8-million successive clutch engagements.*

▶ WRITE FOR MORE FACTS

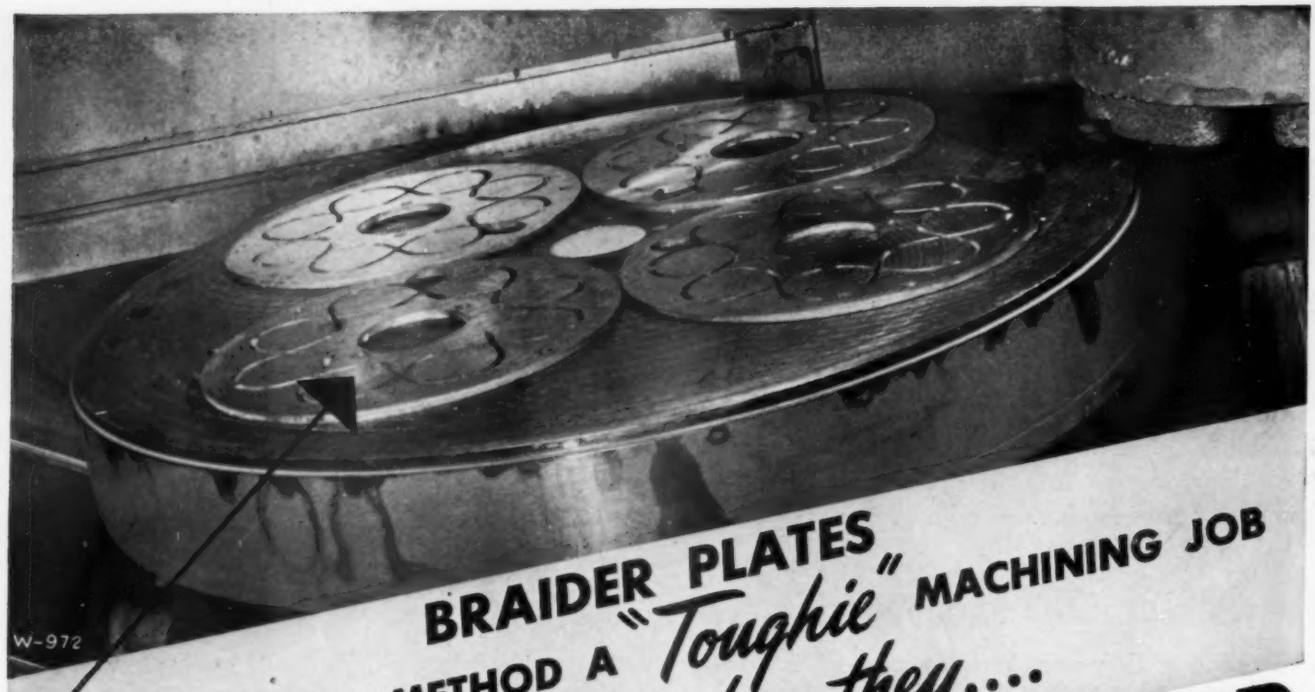
Write today for more facts on the time-saving features of Danly Presses. Find out how Danly Presses can help you cut stamping costs. Ask for a complete presentation and a production estimate.

DANLY MACHINE SPECIALTIES, INC.
2100 SOUTH 52ND AVENUE, CHICAGO 50, ILLINOIS



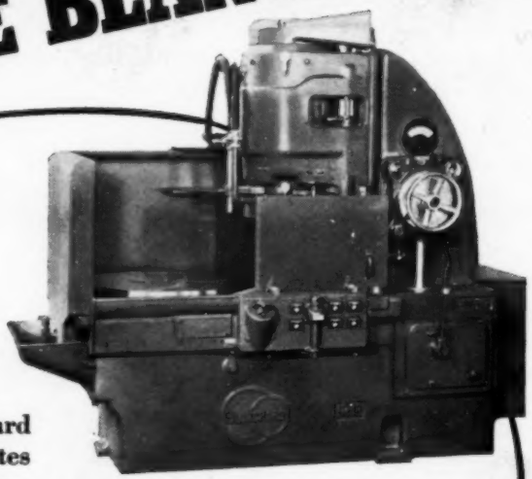
25 YEARS OF DEPENDABLE SERVICE TO THE STAMPING INDUSTRY

MECHANICAL PRESSES AND PRESS EQUIPMENT



BRAIDER PLATES BY ANY OTHER METHOD A "Toughie" MACHINING JOB a "Quickie" when they....

....PUT IT ON THE BLANCHARD



No "sissies" are these Braider Plates—hard cast iron — 18″ O.D, 4″ I.D., .300″ thick — in the difficulty of machining flat, parallel, and to size—all to a tolerance of ± .001″. (That is, by any other method except on a Blanchard.)

On the 42″ chuck of a No. 18 Blanchard Surface Grinder, 8 of these Braider Plates (16 surfaces) are produced per hour. And it's done (a) by clean-up of first surface (b) turning to finish-grind the other surface (c) turning to finish-grind the first surface. Total stock removal 1/32″.

Saving in stock removal by Blanchard Grinding, compared with any other method of machining, is equal to two extra plates for every three plates ground.

Do you know of any other method that would equal this result in time and cost?

If you do flat surface grinding, let us analyze your problems with a view to your getting the most out of every grinding dollar.

Send for your free copy of "Work Done on the Blanchard", third edition. This new book shows over 100 actual jobs where the Blanchard Principle is earning profits for Blanchard owners.

BLANCHARD

The BLANCHARD MACHINE COMPANY

64 STATE STREET, CAMBRIDGE 39, MASS., U S. A.

Butterfield 100% Inspected Tools

PUT ACCURATE THREADING CONTINUALLY ON TAP

in your plant

Accurate tapped holes help speed production because screws, bolts and studs can be driven in faster, more smoothly, with better holding qualities.

To insure accurate, uniform taps, Butterfield inspects *every* tap to be certain it's up to specifications. No hit or miss . . . job lot . . . or statistical inspection will do — *only 100% inspection can make quality certain.*

You can get Butterfield taps at a nearby distributor. He'll give you good service and recommend the right tap for the job you have in mind.

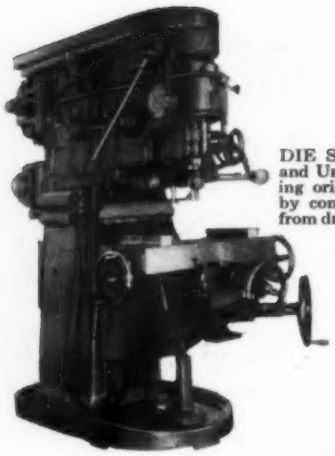
Checking Thread Form and Lead on a Hartness Comparator. Magnification 62½ diameters.

BUTTERFIELD DIVISION,
Union Twist Drill Co., Derby Line, Vermont, and Rock Island, Quebec.

BUTTERFIELD
THE 100% INSPECTED TOOLS
Every Tool Individually Inspected
TAPS • DIES • REAMERS • SCREW PLATES

To any maker of molds for plastics

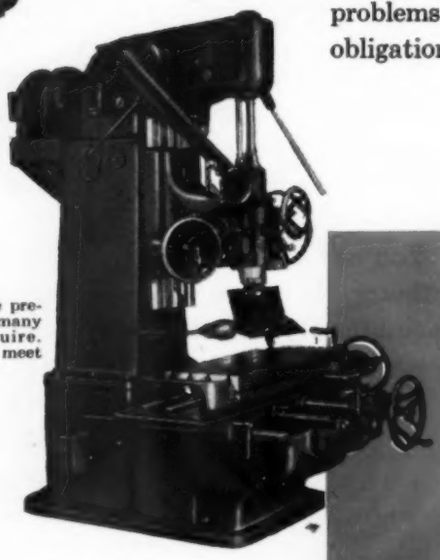
A single source can now supply all equipment



DIE SINKERS — Plain and Universal — for making original molds or dies by conventional methods, from drawings or prints.

Here are four P&W precision machines — selected from a complete line — that are universally recognized as No. 1 equipment for the up-to-date mold maker. This equipment gives the mold shop the fastest means for cutting the complicated precision cavities the plastics industry demands. Each machine is built to P&W's familiar standards of precision and quality — each is designed for utmost performance and economy on its own specialized work. In addition, P&W offers the cutting tools required, including a complete line of burs.

For the mold maker who is interested in delivering better molds, faster . . . made more economically at a better profit . . . P&W has a convincing story. P&W understands mold-making problems and how to conquer them. Let's talk it over — no obligation, of course.



JIG BORERS, for the precision-boring that so many intricate molds require. Three machine sizes to meet every requirement.

PRATT & WHITNEY
Division Niles-Bement-Pond Co.
West Hartford 1, Connecticut

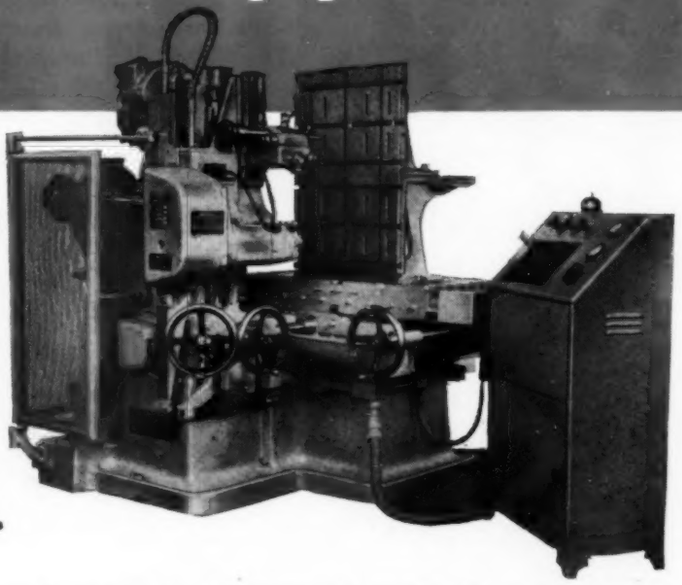
Pratt & Whitney

HEADQUARTERS FOR

Plastic Mold-Making Equipment

KELLERFLEX MACHINES — flexible shaft equipment for efficient finishing and polishing of molds. Fourteen machine models plus a complete line of attachments and accessories.

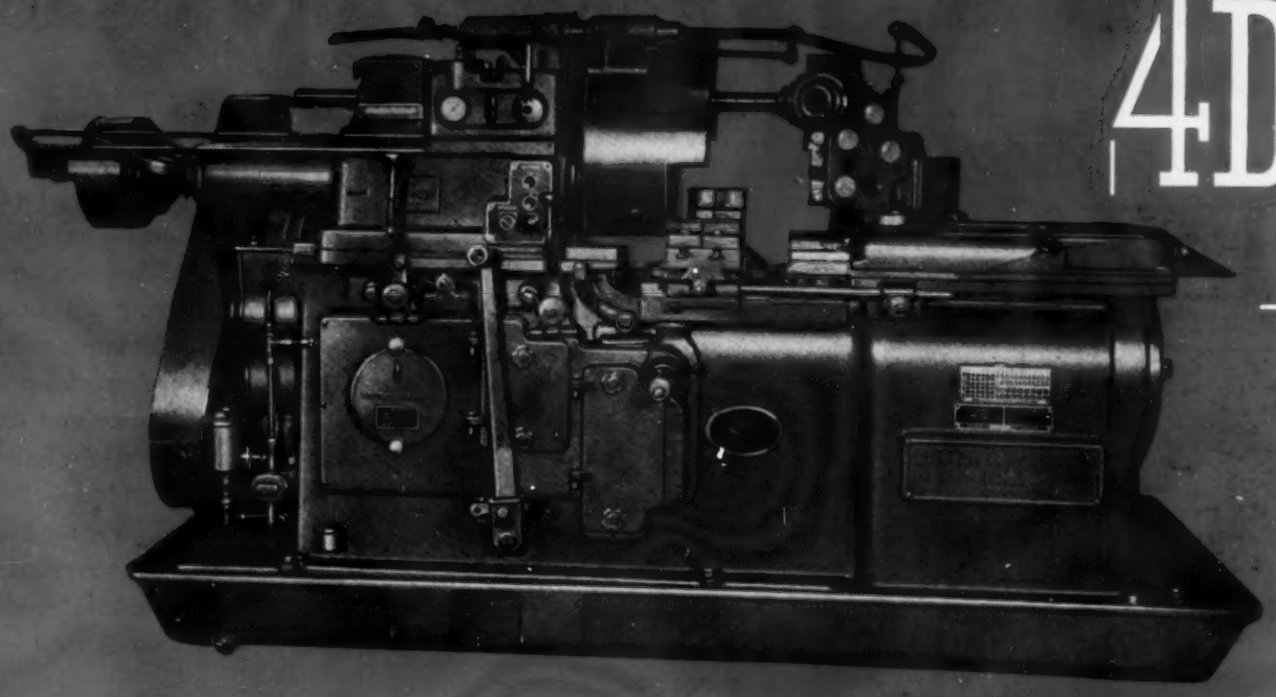
KELLER MACHINES, for cutting intricate plastic molds from easily-made master forms, using automatic tracer control . . . the modern way to get into production quickly.



Also . .

Vertical Shapers
Vertical Die Grinder
The new P&W Jig Grinder
Automatic Duplicating Machines
Keller Cutter and Radius Grinder
Small Tools . . . Gages . . . Keller Burs

"There is no better-paying investment than the right tools for the job"



4D

Small or medium sized parts...can be duplicated profitably...on the

P&J 4D AUTOMATIC TURRET LATHE

Better quality work, increased output and reduction in cost per piece of work produced are advantages achieved in every day operation on the Potter & Johnston 4D Automatic Turret Lathe.

This machine has all the characteristics of larger machines in the P&J line in terms of permanency of alignment, freedom from scoring and long life. It is amply powered for all work within its capacity.

Among the features offered are: a base unit of exceptionally heavy box section; hardened and ground steel ways liberally proportioned; spindle of high carbon steel, mounted on Timken bearings; alloy steel spindle drive shaft mounted on ball bearings; chrome nickel steel headstock gearing.

There are 15 changes of speed; Start-Range 26 to 370 rpm; Semi-High Range 35 to 492 rpm; High Range 69 to 696 rpm; arranged in 5 sets of 3 automatic changes: 27 feeds in geometric progression with three automatic changes are provided. The speed ranges specified represent three different models.

Complete details are available on request.

Condensed Specifications

Swing over bed: 21" (Model 4DE elevated: 25½")

Cross Slide Travel (each way): 3¼"

Swing over cross slide: 9¾" (Model 4DE: 14⅞")

Turret Faces: 5 (4&6 optional)

Turret Feed: 5½"

OTHER P&J AUTOMATIC TURRET LATHES

Model 3U
(Swing over cross slide: 9½")

Model 5D
(Swing over bed: 25")

Model 5D2
(2-Spindle Swing Limited by Spindle to Spindle Center Line Distance 10½"-15½")

Model 6DRE
(Swing over bed: 34")

Model 6DS
(Swing over bed: 34" and 40")

Model 8DT
(Swing over bed: 36")

For more complete information send for catalogue 1a/25a.

Pioneer Manufacturer of Automatic Turret Lathes

POTTER & JOHNSTON COMPANY

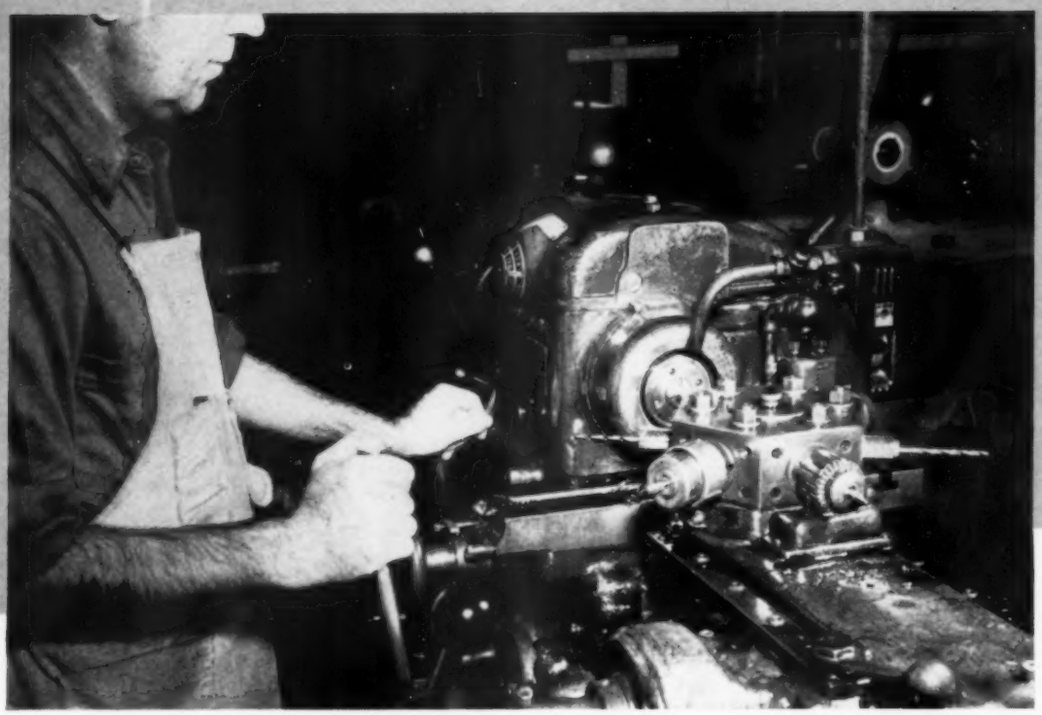
Pawtucket, R. I.

Subsidiary of

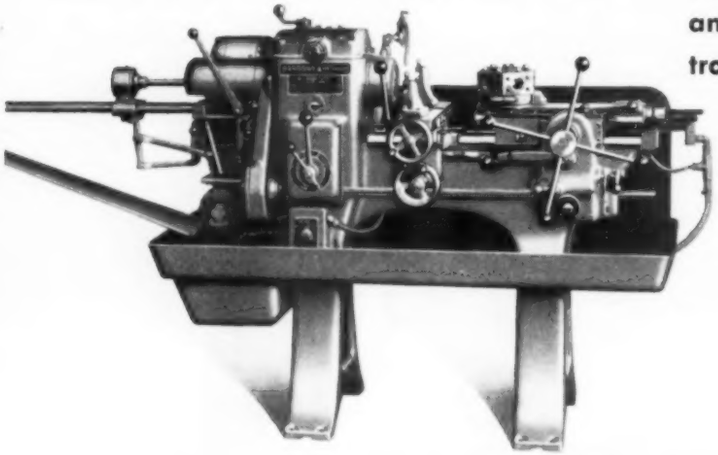
PRATT & WHITNEY

Division of Niles-Bement-Pond Company

Bardons & Oliver *No. 2 Geared Electric Turret Lathe* gives THE PACKARD MOTOR CAR COMPANY a high rate of production on clutch shifter relay levers . . .



The above operation consists of centering, drilling and tapping. The double set of tools on the turret, as shown in cut, saves time. The output is 65 pieces per hour. The machine is one of a battery of nine in the department used on similar work.



The No. 2 Geared Electric Turret Lathe is outstanding on small and medium size bar and chucking work. The electric remote control, the exceptionally rapid spindle reversal, the electric power operation of collet chuck and bar feed, together with many other prominent features all combine to provide top productive capacity.

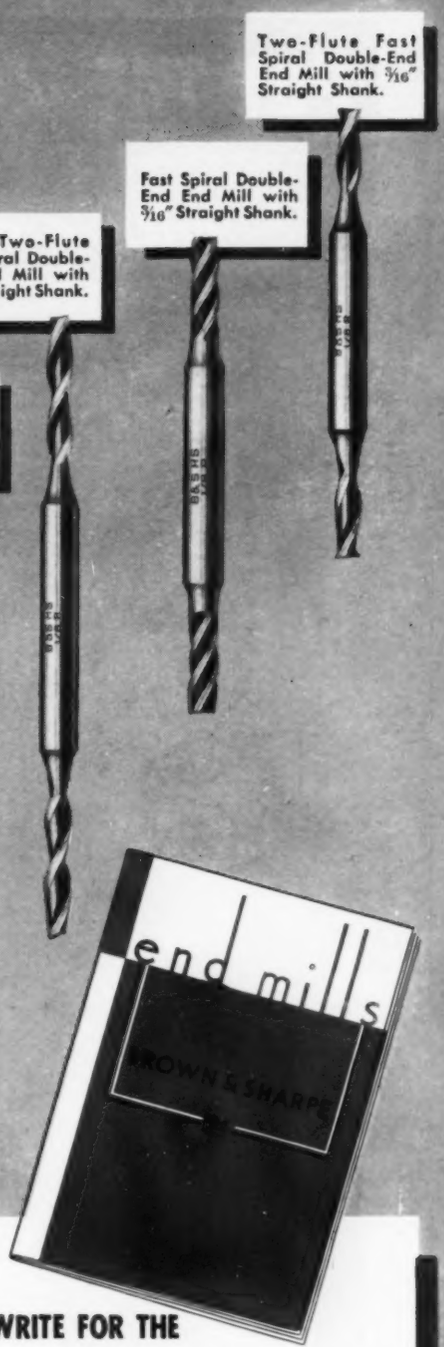
Write for circular.

Builders of a complete line of Ram and Saddle Type Turret Lathes, also Hydralectric, Hydraulic and Hand Operated Cutting-Off Machines.

BARDONS & OLIVER, INC.

1133 WEST 9TH STREET • CLEVELAND 13, OHIO

For More Accurate Selection of Quality End Mills BROWN & SHARPE OFFERS 8 ADDITIONAL TYPES

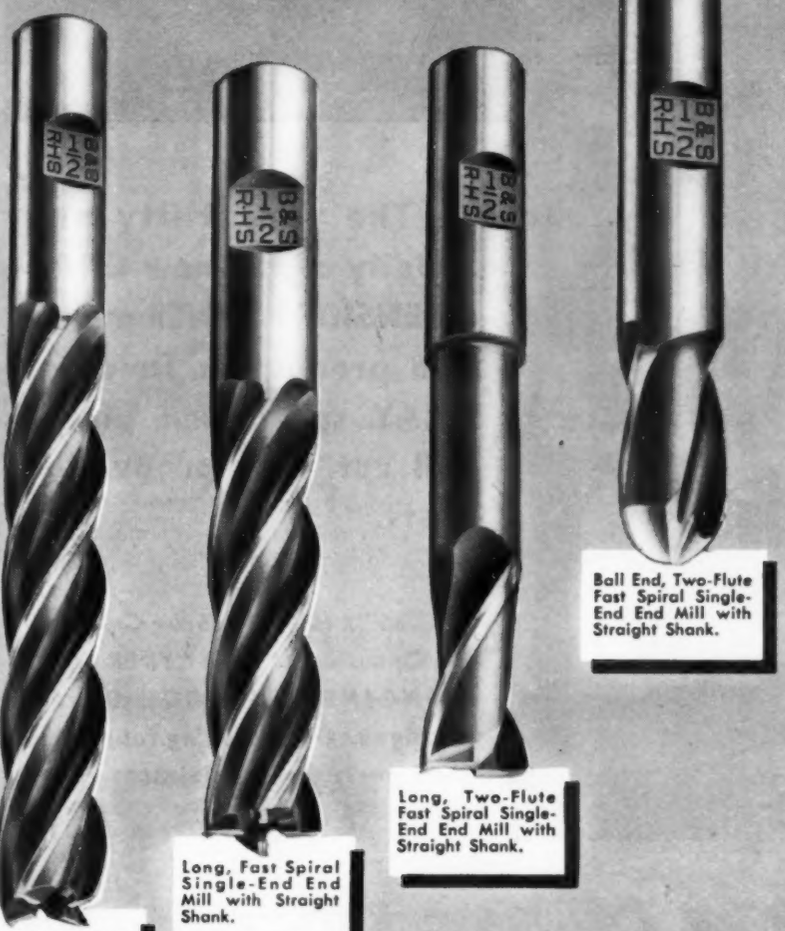


Two-Flute Fast Spiral Double-End End Mill with 3/16" Straight Shank.

Fast Spiral Double-End End Mill with 3/16" Straight Shank.

Long, Two-Flute Fast Spiral Double-End End Mill with 3/16" Straight Shank.

Long, Fast Spiral Double-End End Mill with 3/16" Straight Shank.



Ball End, Two-Flute Fast Spiral Single-End End Mill with Straight Shank.

Long, Two-Flute Fast Spiral Single-End End Mill with Straight Shank.

Long, Fast Spiral Single-End End Mill with Straight Shank.

Extra Long, Fast Spiral Single-End End Mill with Straight Shank.

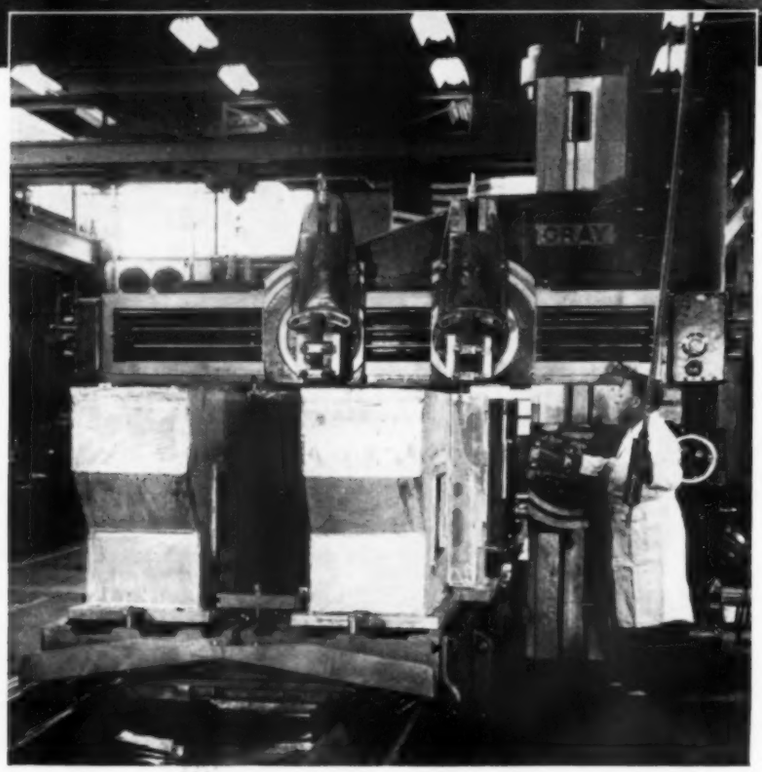
WRITE FOR THE NEW HANDY-SIZE CATALOG

describing important production-improving features of all Brown & Sharpe End Mills together with complete specifications and prices. There's a Brown & Sharpe quality end mill to meet every end milling need. Brown & Sharpe Mfg. Co., Providence 1, R. I., U. S. A.

We urge buying through the Distributor

BROWN & SHARPE CUTTERS B·S

PUT THE "Prod" IN YOUR Production with a new GRAY PLANER



The versatility and rigidity of the new GRAY OPENSIDE PLANER makes it a production favorite. GRAY speed and power will cut your production costs.

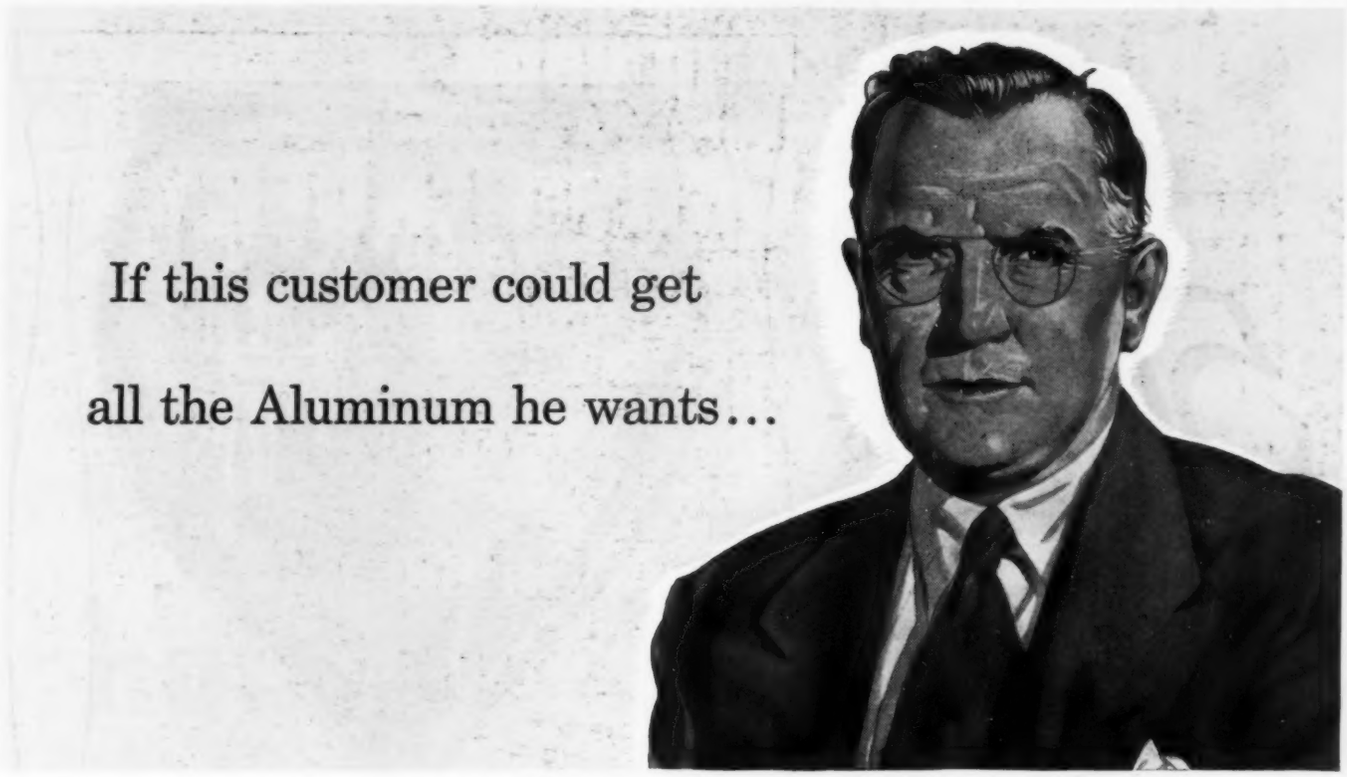
•

66" x 60" x 20' Gray Convertible Openside at the SNYDER TOOL & ENGINEERING CO., Detroit, Michigan. Gang planing fabricated steel parts for special automotive machinery.

The G.A. **GRAY** *Company*

planers • milling planers
planer type milling machines
horizontal boring machines

CINCINNATI 7, OHIO, U. S. A.
SOLD IN CANADA BY UPTON, BRADEEN AND JAMES, LTD. • SOLD IN LATIN AMERICA BY MACHINE AFFILIATES



HE: ***Every woman knows aluminum kitchenware! Millions will want my nursery equipment . . .***

WE: ***That's why saying NO is so tough . . .***

There is no mystery in the reasons.

We have talked aluminum, aluminum, aluminum, for sixty years.

Manufacturers, and Americans in general, during the war, learned what aluminum could do. As it fought America's battles in the sky, they saw it win other battles against great stresses, against corrosion, against old-fashioned manufacturing methods. Hundreds of thousands of skilled American hands learned to work with aluminum . . .

All of these facts, put together, caused a kind of postwar revolution. A manufacturer of nursery equipment, or farm roofing, or appliances, or irrigation systems, redesigned his line to take advantage of aluminum's usefulness. *Suddenly, thousands of such manufacturers were clamoring for aluminum!*

So many that—with aluminum as with countless other products—the world demand exceeded the supply. And America's new aircraft program subtracts its large and necessary share.

That is why, right at this enthusiastic moment, events force us to learn to say NO. We must say a flat NO to those who want aluminum because they can't get their regular metal. A milder NO to new aluminum users with ideas that are economically sound. We will endeavor to supply them with the small amounts needed for experimental use. Very drastic NO's to many of our own fabricating plants, which, for some time, we have operated at only a fraction of their capacity.

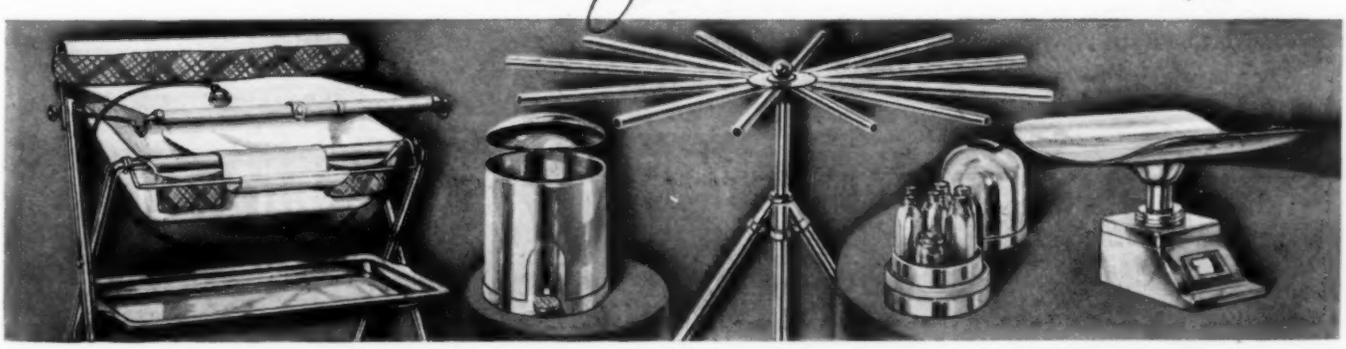
Every time we have to say NO to a customer, it will be the fairest NO we know. Our first obligation is, of course, to the host of old customers who have put all their eggs in the aluminum basket.

But there will be no light decisions. Your Alcoa salesman and his District Manager will work out the answers, as a team whose guiding motive is this:

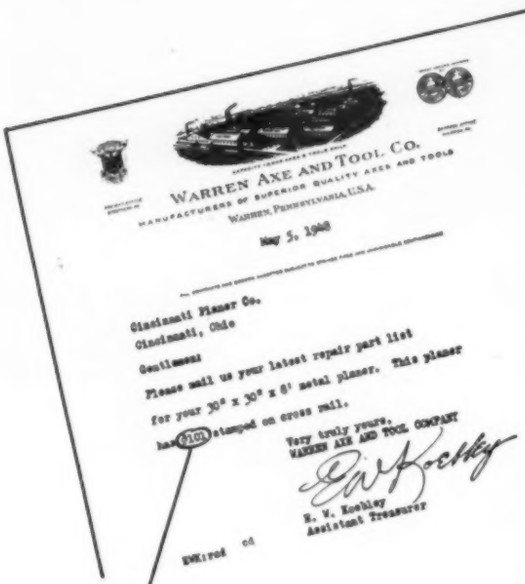
We want more and more of your business, as soon as we can make more aluminum available.

ALUMINUM COMPANY OF AMERICA, 2107 Gulf Building, Pittsburgh 19, Pa. Sales offices in principal cities.

ALCOA *first in Aluminum*



50 years


WARREN AXE AND TOOL CO.
MANUFACTURERS OF SUPERIOR QUALITY AXES AND TOOLS
WARREN, PENNSYLVANIA, U.S.A.

May 5, 1948

Cincinnati Planer Co.
Cincinnati, Ohio

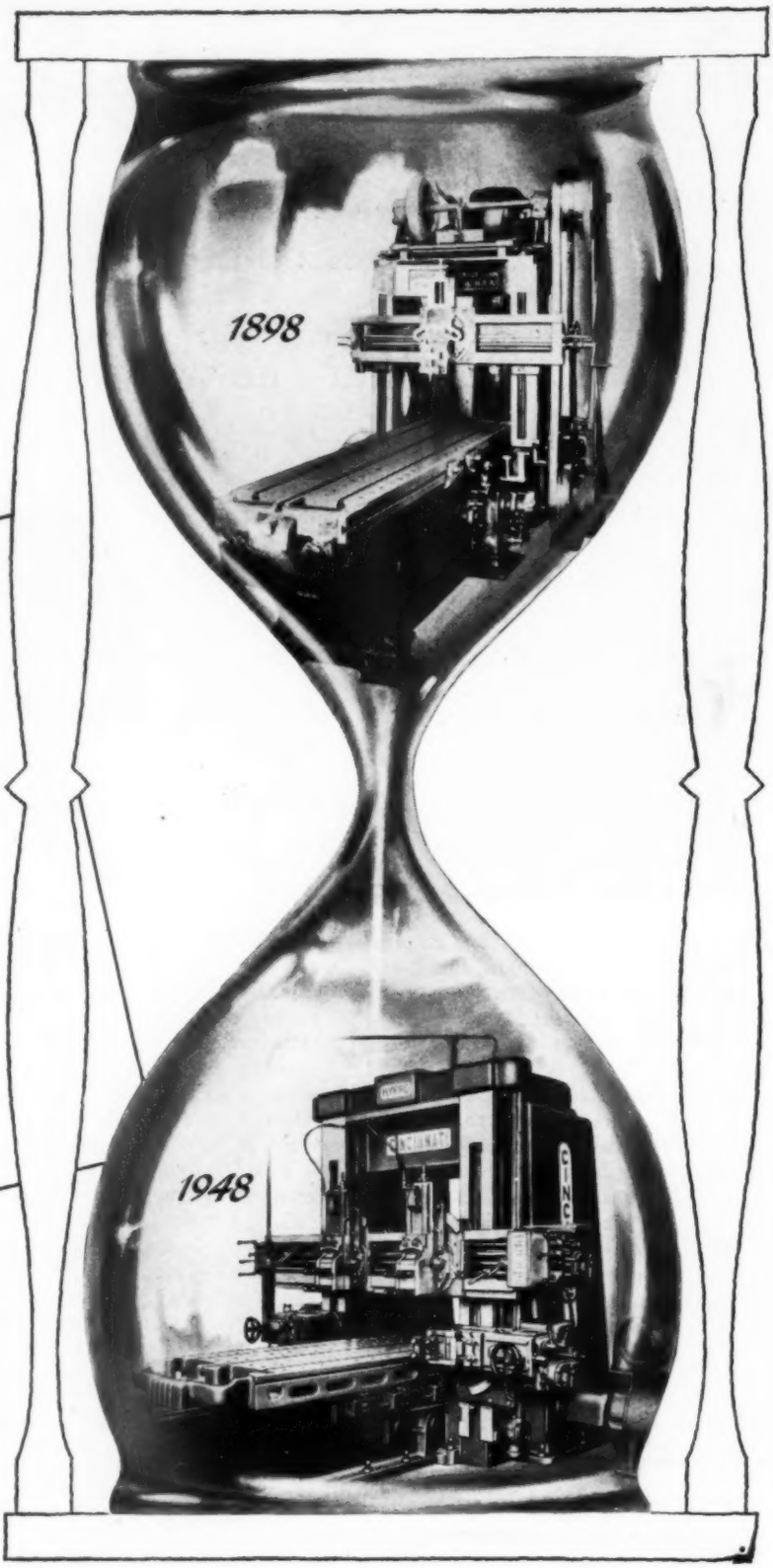
Gentlemen:

Please mail us your latest repair part list for your 30" x 30" x 8' metal planer. This planer has No. 101 stamped on cross rail.

Very truly yours,
WARREN AXE AND TOOL COMPANY

R. V. Koehley
Assistant Treasurer

RVK:rod cc



No. 101 was the first Planer manufactured by the Cincinnati Planer Company. They made a good Planer in 1898 of highest quality and finest workmanship which has stood the test of time.

Today we make an even better Planer. The modern Cincinnati HYPRO Planer, still retaining all of the Hypro-duction features and craftsmanship developed through years of experience, has been improved to incorporate new and exclusive features such as centralized finger-tip control for the complete operation of the machine, all steel hardened "twin" helical gear train, double nuts on both saddle and down slide screws, inverted dovetail slides, double acting tool block abutment, centralized dual saddle control and precision adjustment handles. These features provide increased production, lower planing costs and convenience to the operator.

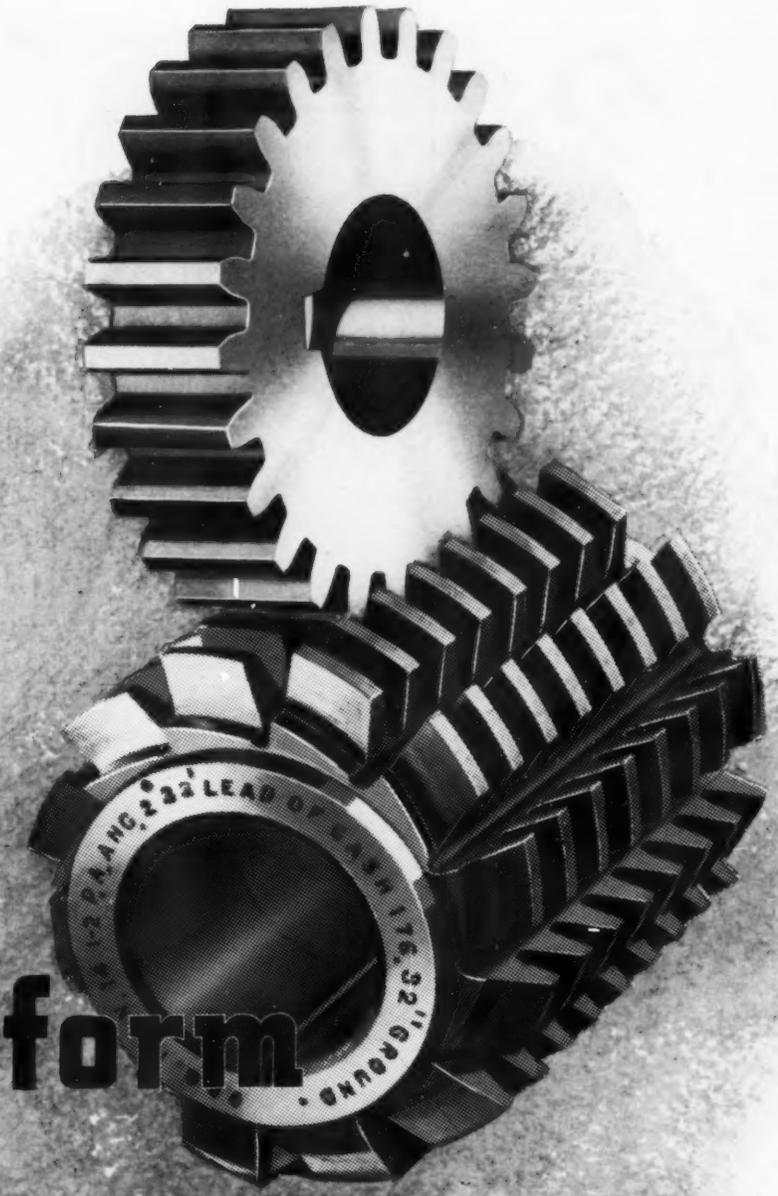
Bulletin No. 138 will give you complete specifications. Write for it today.

THE CINCINNATI HYPRO PLANER COMPANY

PLANERS · BORING MILLS · PLANER TYPE MILLERS

CINCINNATI, OHIO

no other hob will outperform a UNION



See Catalog R
for various types of hobs

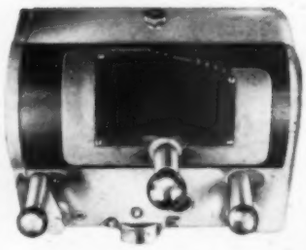
contact your local distributor

UNION TWIST DRILL COMPANY, ATHOL, MASSACHUSETTS

MILLING CUTTERS • GEAR CUTTERS • TWIST DRILLS • HOBS • REAMERS • CARBIDE TOOLS

We own and operate S. W. CARD MANUFACTURING CO. Division, Mansfield, Mass., Taps, Dies, Screw Plates.
BUTTERFIELD DIVISION, Derby Line, Vt., Taps, Dies, Screw Plates, Reamers.
BUTTERFIELD DIVISION, Rock Island, Que., Milling Cutters, Twist Drills, Hobs, Reamers, Taps, Dies, Screw Plates.

4

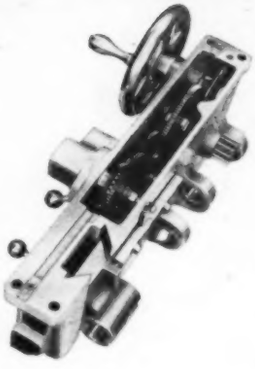


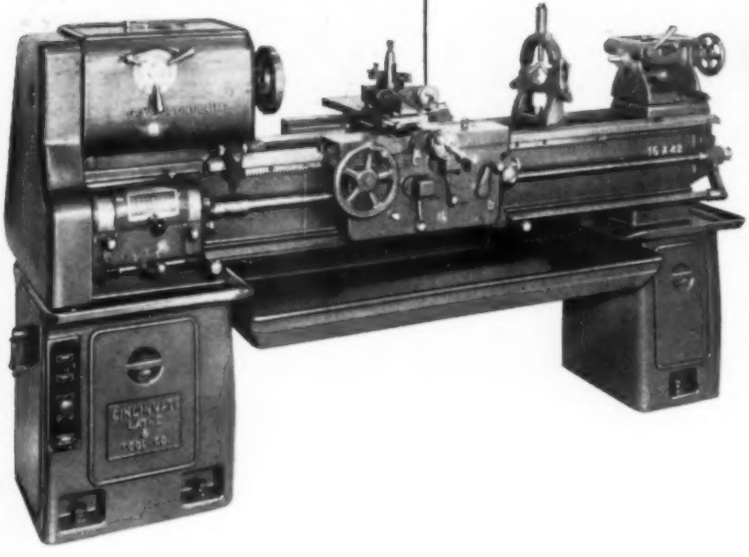
3

GET MORE

2

5





The completely new Tray-Top Cintilathe gives you more valuable features than any other lathe in its price class. 10", 12½", 15" and 18" swing sizes. Distance between centers from 18" to 60".

PAY LESS

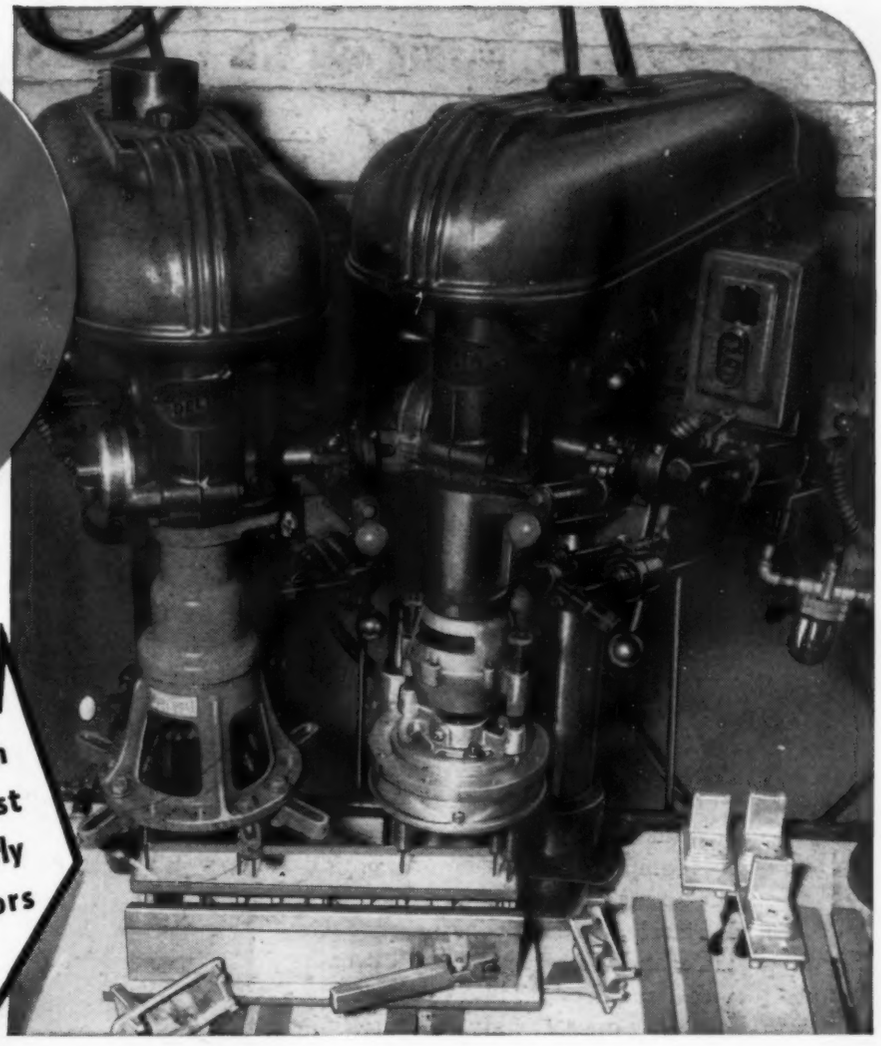
Here are 10 practical reasons for making your next engine lathe a Tray Top: **(1)** Tray-Top on headstock and tailstock provides convenient "parking space" for tools. **(2)** 12 spindle speeds selected by color-coded dial, all geared transmission featuring flame hardened gears. **(3)** 48 thread and feed changes. **(4)** Unusually large spindles – rigidly mounted in precision anti-friction bearings – two on the 10" and 12½" size – three on the 15" and 18" size machines. **(5)** Double wall apron. **(6)** Totally enclosed change gear box. **(7)** Simple unique method of changing from English to Metric thread chasing or vice versa. **(8)** Enclosed electrical panel. **(9)** Optional drive, reversing motor control or multi-disc clutch and brake. **(10)** Cabinet legs . . . 15" and 18" sizes can be furnished with gap and gap block. **WRITE FOR BULLETIN T-100.**

cintilathe

the best buy in its class

CINCINNATI LATHE & TOOL CO., CINCINNATI 9, OHIO

EXTRA PROFITS COME FROM GROUPING OPERATIONS



ONE operator handles both drilling and tapping at almost DOUBLE the production formerly obtained by TWO operators

Two operators drilling and tapping separately 6 holes, 7/64" in diameter, were producing 1500 to 1800 completed die cast parts an hour.

By grouping the two operations on one simple, inexpensive, tool-room-built unit, fed by Bellows "Controlled-Air" Powered Feeds (electrically synchronized) one man performs both operations and obtains almost double the production — 2500 to 3000 complete pieces per hour.

Multiple operations on the same work piece can often be grouped and handled automatically with inexpensive tool-room-built special purpose machines made by combining standard machine tool units with Bellows "Controlled-Air" Power Feeds.

Bellows "Controlled-Air" Power Feeds advance work or tools a pre-determined distance, under a pre-determined thrust. Traverse speeds are independently controlled and are adjustable to any desired degree. As many as fourteen electrically-controlled Bellows Feeds may be synchronized to operate automatically with a single work holding fixture.

The Bellows "Controlled-Air-Power" Feed is typical of Bellows "Controlled-Air-Power" Equipment designed for faster, safer, better production. Write today for descriptive bulletins showing our complete line of Air Motors, Cylinders, Presses, Work Holding and Feeding Equipment.

The Bellows Co.

AKRON, OHIO

ELECTRONIC HEATERS ON THE JOB: HARDENING PINIONS

saving per pinion: $.25
production boost: 1500%
better product: no warpage

BIG DIVIDENDS are being realized with a G-E 20-kw electronic induction heater at the Ajax Flexible Coupling Company, Westfield, N. Y.

With one G-E electronic heater, this company now hardens the pinion cut on a shaft in a single operation. Formerly, two salt baths, quench tank, and a stress-relieving oil bath were required. Time - consuming handling operations have been eliminated; expensive machining operations have been reduced. Working conditions have been greatly improved.

What was formerly a half-month's production is now accomplished in *one* day with the G-E electronic heater. Cost savings of $.25 per pinion have been realized.

Also, the G-E electronic heater has greatly improved the quality of pinion shafts manufactured by this company. Shaft warpage has been completely eliminated. Gear-tooth distortion has been minimized, making a much quieter running gear.

Net result: more and better products at lower cost with induction heat.

Electronic
INDUCTION HEATERS

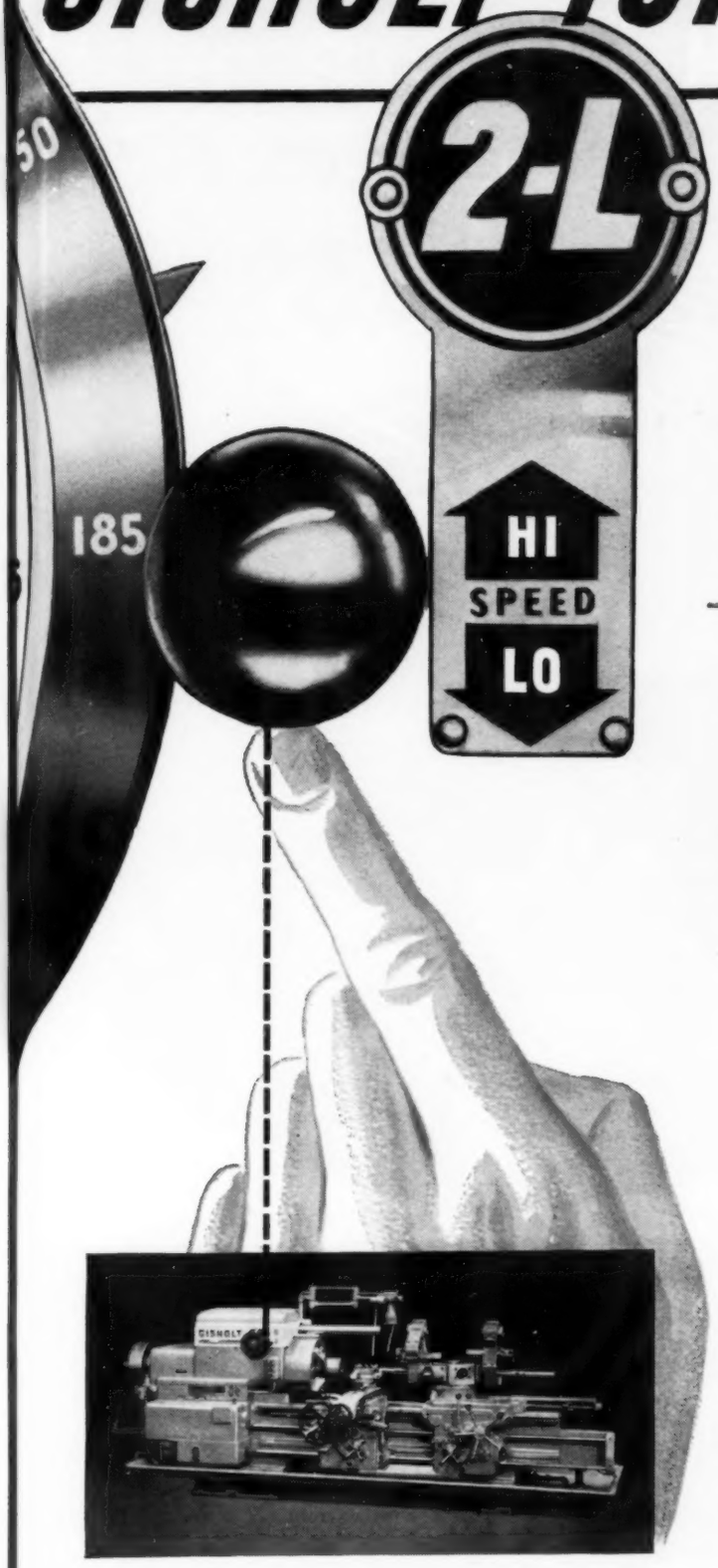
YOUR PRODUCT AND INDUCTION HEATING

Whether your product involves brazing, soldering, hardening, or annealing, be sure to get in touch with the Heating Specialist in the nearest G-E Office. His suggestions are very likely to result in higher production, lower cost, and better products, as they have for many other manufacturers. In the meantime, send for free bulletin GES-3290, "The How and What of Electronic Induction Heating." ***Sect. 675-179, Apparatus Department, General Electric Company, Schenectady 5, N.Y.***

GENERAL ELECTRIC

675-179

GISHOLT TURRET LATHES



INSTANT SPEED CHANGES at the *FLIP* of a *FINGER!*

No manual gear shifting. Just touch this knob for quick high-low or low-high spindle speed shifts. A great timesaver — *Boosts Production!*

Speed changes (6-1 ratio) are made by hydraulically operated clutches. This standard feature on all Gisholt Turret Lathes is a big advantage in drilling-tapping, boring-reaming, and turning-threading operations.

THE GISHOLT ROUND TABLE represents the collective experience of specialists in machining, surface-finishing and balancing of round and partly round parts. Your problems are welcomed here.

GISHOLT MACHINE COMPANY
Madison 10, Wisconsin

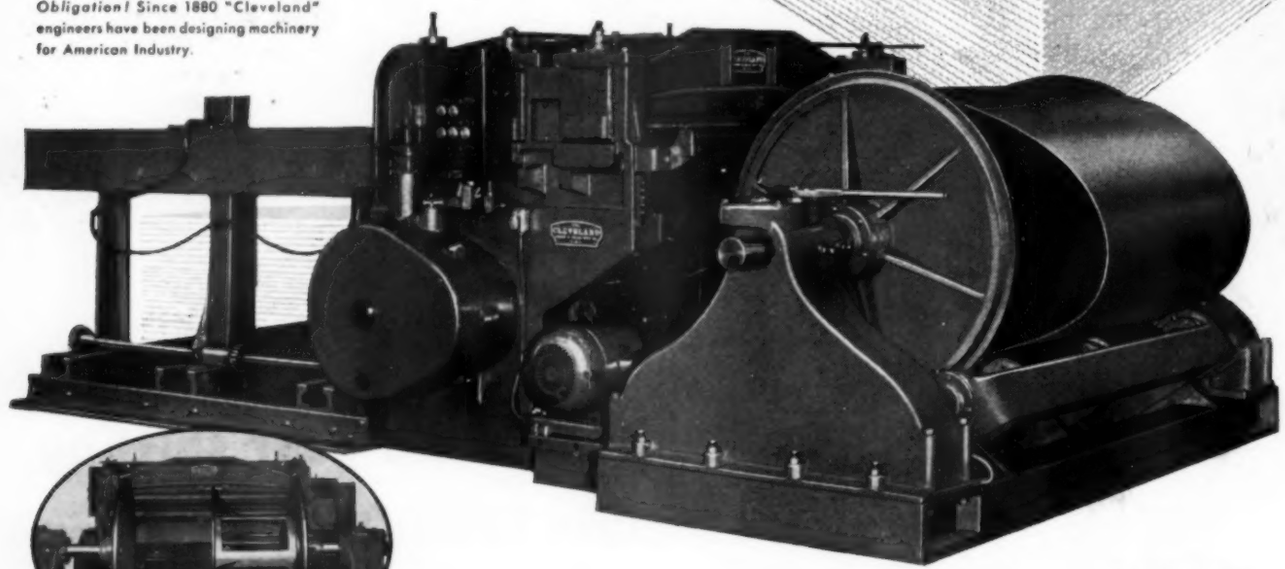
TURRET LATHES • AUTOMATIC LATHES • SUPERFINISHERS • BALANCERS • SPECIAL MACHINES

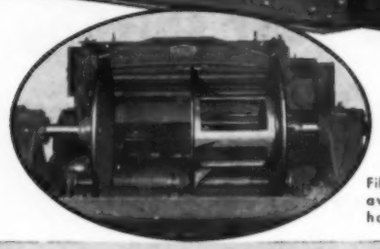
CLEVELAND SHEARS OFFER UP TO 60 CUTS PER MINUTE!

From COILS... to SHEETS... to STACKS!

This "Cleveland" engineered shear is made in various capacities to meet all high speed production requirements. This model has a speed up to 60 strokes per minute with a feed up to 200 feet per minute. Each is variable in proportion. Stock may be 24" to 78" wide. Operation is automatic, semi-automatic or hand controlled. All rollers are covered and designed to continuously bear on outside of coil as coil decreases. The uncoiler is heavy duty of the cradle type and there are many other important features.

If you have special production problems, consult with our engineering staff at *No Obligation!* Since 1880 "Cleveland" engineers have been designing machinery for American Industry.





Fillers as shown at left are available for the efficient handling of narrow coils.

For more information on "Cleveland" shears or power presses, address inquires to DEPT. 5-AM.

THE NEW PATENTED "CLEVELAND" DRUM TYPE FRICTION CLUTCH & BRAKE

For greater power press efficiency and reduced production costs, designed to give full clutch and full break, as needed. ¼ the weight of the conventional disk friction clutch and brake, with ½ the number of parts. Now available for all types, sizes and makes of mechanical power presses.

WRITE TODAY FOR FURTHER INFORMATION!

PUNCHING TOOLS & DIES

OFFICES AT:
NEW YORK.... CHICAGO
DETROIT.... PHILADELPHIA
PITTSBURGH

THE CLEVELAND PUNCH & SHEAR WORKS CO.
U.S.A.
Established 1880

FABRICATING TOOLS

CLEVELAND 14, OHIO

• • • • • POWER PRESSES • • • • •

Because they are the hardest dressing sticks made, NORBIDE* sticks dress tool wheels quickly, efficiently—and have extremely long service life. Small (3/16 x ½ x 3″), lightweight and easy to use, NORBIDE dressing sticks are perfect for tool wheels 10″ and smaller, especially cup and saucer shapes. They are low heat conductors and therefore will not burn the hand.

NORBIDE dressing sticks were first introduced to the trade two years ago. Such long service have they given that the original sticks are still being used in many plants. NORBIDE dressing sticks are molded, without bond, from Norton Boron Carbide—"the hardest material made by man." *For further information write to:*

NORTON COMPANY — WORCESTER 6, MASS.

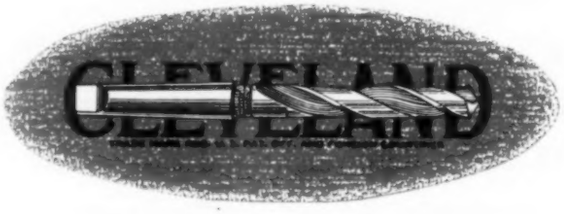
*Reg. Trade-Mark

Choosing the Right Stock Drill

- **Cuts Your Cost Per Hole**
- **Eliminates Breakage**
- **Speeds Production**

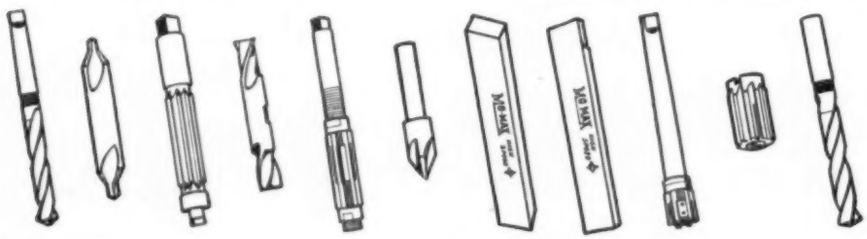
Yes, there are many advantages in selecting the right drill for each job. For instance, one of our customers was getting excessive breakage with regular jobbers' length drills on the set-up pictured here—drilling holes 7/16 inch deep in stainless steel. A *Cleveland* Service Representative was able to correct this situation by recommending a stub screw machine drill which, because of its heavier construction and shorter length, is giving complete satisfaction. *Your* drilling problems, too, perhaps can be solved by a *Cleveland* Service Representative—without cost or obligation. Contact our nearest Stockroom, or . . .

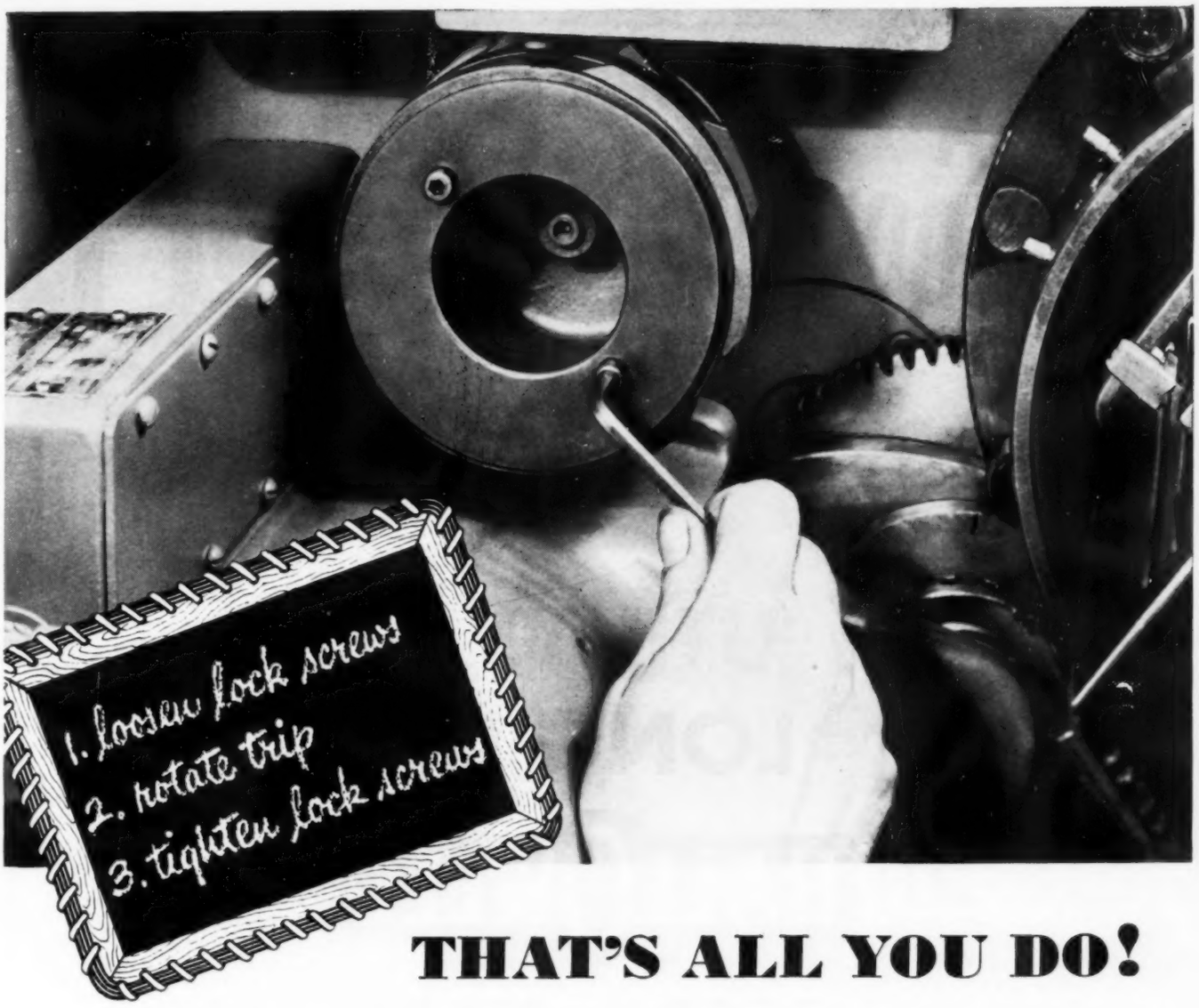
Telephone Your Industrial Supply Distributor



THE CLEVELAND TWIST DRILL CO.
1242 East 49th Street **Cleveland 14, Ohio**
Stockrooms: New York 7 • Detroit 2 • Chicago 6 • Dallas 1 • San Francisco 5
Los Angeles 11 • London W. 3, England

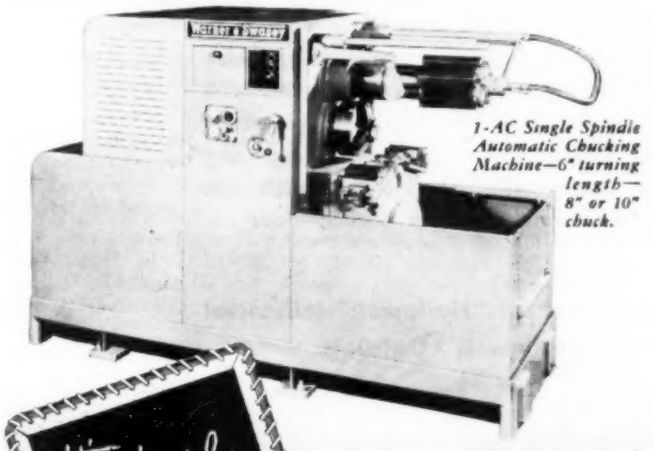
ASK YOUR INDUSTRIAL SUPPLY DISTRIBUTOR FOR THESE AND OTHER CLEVELAND TOOLS





THAT'S ALL YOU DO!

TO set late or dwell cross slide operation on the new 1-AC Camless Automatic Chucking Machine, simply loosen two small socket head screws, turn the rotary trip to the new position and tighten the screws. That's all. Camless operation simplifies setup and eliminates cost of making, storing, finding, changing cams.



1-AC Single Spindle Automatic Chucking Machine—6" turning length—8" or 10" chuck.

Nine big features make this *the* profitable machine for short and long production runs:

1. Eight ranges of four automatically selected speeds.
2. Any speed, within a selected range, may be set on any turret face and may be changed during the stroke.
3. Any three, out of eighteen feeds from .002" to .083", are automatically available during operation.
4. Either or both cross slides can be selected to operate with any or all turret faces.
5. Turret can be automatically skip-indexed to eliminate unnecessary approach strokes.
6. Alternative hand control of all functions.
7. Reduced number of bearing surfaces and smooth shockless indexing retain original accuracy.
8. Advanced design reduces tool overhang for less chatter, closer tolerances.
9. Adequate chip clearance and capacity . . . Selector valve delivers coolant to operating station only.

It's simpler **to set up a Warner & Swasey CAMLESS Automatic!**

WARNER & SWASEY
Cleveland

TURRET LATHES, MULTIPLE & SINGLE SPINDLE AUTOMATICS, PRECISION TAPPING AND THREADING MACHINES

A STANDOUT...

FIG. 732
Pat. & Pats. Pending
Drawer is extra

for UTILITY and LONG LIFE

HALLOWELL

READY-MADE
WORK BENCHES OF STEEL

The serviceable, ready-made "Hallowell" Work Benches of Steel are ideal equipment for modern shops. "Hallowell" Benches have smooth, long-wearing steel tops, are also available with heavy, high-grade laminated wood tops—or steel tops covered with "Tempered Presdwood." Made in 4 standard heights, 3 widths and 7 lengths, these "Hallowell" units can be bolted together to form a continuous work-bench—most any length—or taken apart and used individually—a money-saving feature *not practicable* with "nailed-together" wooden benches. The "Hallowell"—rigid as a rock—*does not* require costly bolting to the floor.

Write us for the name and address of your nearest "Hallowell" Industrial Distributor and your copy of the "Hallowell" Catalog.

OVER 45 YEARS IN BUSINESS

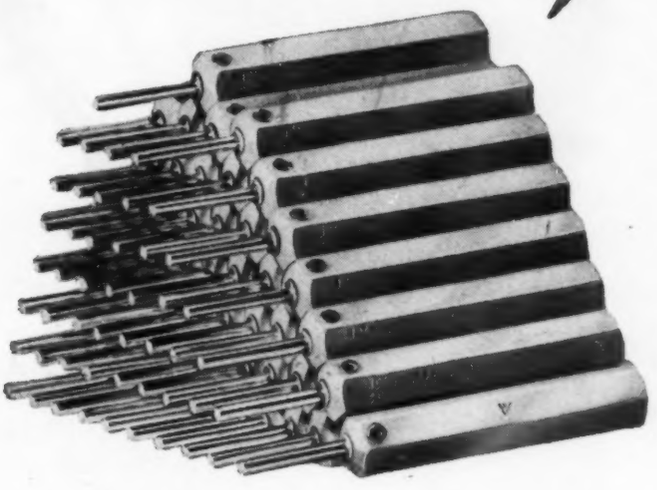
STANDARD PRESSED STEEL CO.

JENKINTOWN, PENNA. BOX 4

BRANCHES: CHICAGO DETROIT INDIANAPOLIS ST. LOUIS SAN FRANCISCO

Van Keuren

CARBOLOY
Wire Type
PLUG GAGES
are the right answer



1 VK CARBOLOY=50 TOOLSTEEL GAGES

After considerable experimentation with various wear resistant materials, we have chosen Carboloy as being the most practical, durable and economical. Carboloy does not flake or chip easily and is quite suitable for wire type plug gages as small as .020" in diameter.

Wire Type Plug Gages were originated by the Van Keuren Co. in 1925 and are now recognized as the most economical gages for measuring small holes. The original wire type plug gages were made of tool steel—High Speed steel doubled gage life. VK Chromium Plate gave 5 times the life, and VK Carboloy 50 times the life of tool steel gaging units. All of these materials are still in use and have their particular applications.

VK Carboloy gaging units are made in sizes from .020" to .500" diameter. They are made only in the wire type design because this is by far the most economical plug gage. In cases where it is desired to use VK Carboloy wire type Go units with existing No Go taper insert units, special handles can be furnished for this purpose.

Van Keuren Wire Type Plug Gages assure longer lasting precision and lower gage cost, because the entire 2" length of gage can be used. When the end of the wire becomes worn, it is ground off. The wire type unit is securely held in the unit by a split bushing and a headless set screw.

VK Carboloy Wire Type Plug Gages are made to Class B accuracy, plus .00005" minus, .00000" on the Go unit and plus or minus .000025" on the No Go unit. Closer or wider tolerances can be supplied if desired.

On your next order Specify VK Wire Type Plug Gages: VK Carboloy for long runs because of the enormous saving in gage cost; VK Carboloy for fussy jobs because of the infinitesimal gage wear and insurance that the parts will be within the specified limits; VK Tool Steel—High Speed Steel—Precision Chromium for less exacting jobs. You will be assured of the best in accuracy, quality and delivery.

The VK Caalog and Handbook No. 34 is a 208-page manual, indispensable for engineers, designers, inspectors, toolmakers and machinists.

It contains simplified formulas and accurate tables for measuring spur gears, helical gears, splines, serrations and worms.

It is the only book which gives the new accurate formulas and tables for measuring the pitch diameter of screw threads. The information on this subject is epoch-making in character.

It includes a new method for measuring the included angles of screws and a new method of inspecting flat ring surfaces with light waves and a wealth of other hard to find and valuable information.

Write today for your copy.

THE Van Keuren CO., 176 WALTHAM STREET, WATERTOWN, MASS.

29th YEAR

Light Wave Equipment • Light Wave Micrometers • Gage Blocks • Taper Insert Plug Gages • Wire Type Plug Gages • Measuring Wires • Thread Measuring Wires • Gear Measuring System • Shop Triangles • Carboloy Plug Gages • Carboloy Measuring Wires

FOR MORE PRODUCTION

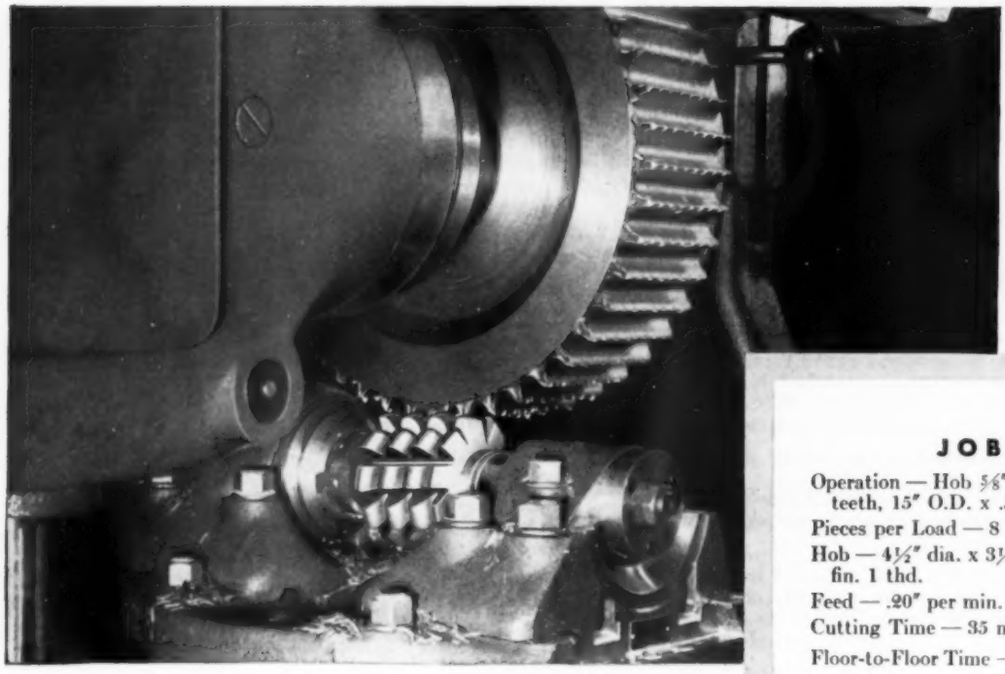
The flexibility of the No. 14-15 Hobbing Machine for hobbing a wide variety of work — ranging from large coarse pitch gears to long spline shafts — provides low-cost production efficiency, with a minimum investment in special equipment. Consistent accuracy is possible because of rigid massive construction, hardened and ground "V" ways, and positive mechanical control over all machine functions.

These large diameter, coarse pitch roller chain sprockets require a machine with rigidity and strength for efficient production. The Barber-Colman No. 14-15 Hobbing Machine provides capacity to finish hob, in *one cut*, a load of 8 sprockets in 42 minutes floor-to-floor time, or a total of 104 sprockets per 9 hour shift. Automatic cycling furnishes easy control over all machine movements, and a special hydraulically operated work arbor speeds loading time.

Send for a copy of Bulletin 3220 describing ample capacity and rigidity of this machine for heavy cuts.

Barber-Colman Company

GENERAL OFFICES AND PLANT 116 LOOMIS ST., ROCKFORD, ILLINOIS, U.S.A.



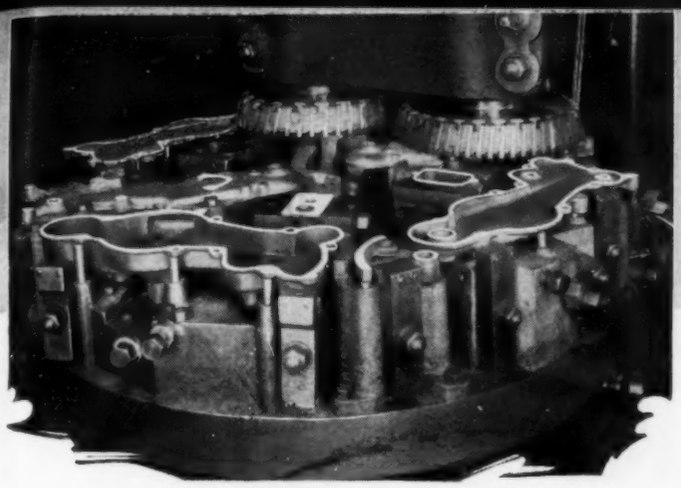
JOB FACTS

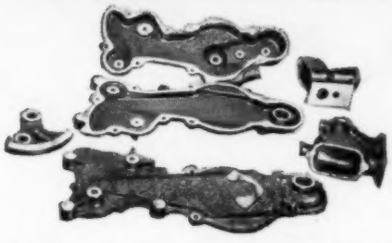
Operation — Hob 5/8" roller chain sprockets, 46 teeth, 15" O.D. x .575" face.
Pieces per Load — 8
Hob — 4½" dia. x 3½" length, str. bore, ungrd. fin. 1 thd.
Feed — .20" per min. Hob Speed — 77 RPM
Cutting Time — 35 minutes
Floor-to-Floor Time — 8 sprockets every 42 min.

BARBER COLMAN

A COMPLETE HOBBING SERVICE

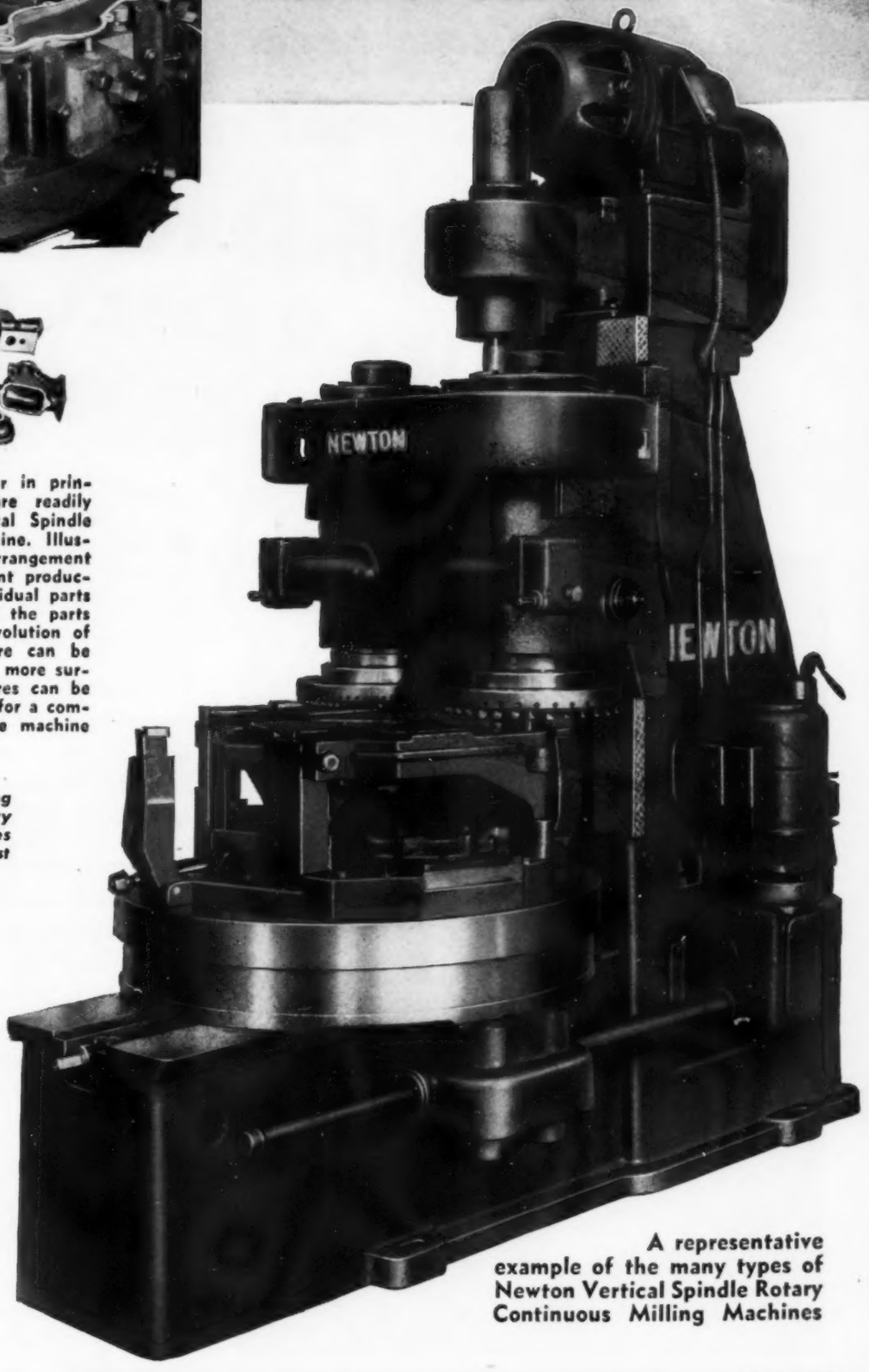
Let one machine with one operator do the work of several





Work-piece arrangements, similar in principle to that shown above, are readily handled on any Newton Vertical Spindle Rotary Continuous Milling Machine. Illustrated here is a fixture arrangement especially adapted to smaller plant production where the quantity of individual parts to be finished is limited. All of the parts shown can be milled at one revolution of the table. Similarly, the fixture can be arranged to accommodate two or more surfaces of the same piece. Fixtures can be arranged to mill all parts needed for a complete assembly, thus keeping the machine in continuous production.

Complete information covering Newton Vertical Spindle Rotary Continuous Milling Machines will be furnished upon request



A representative example of the many types of Newton Vertical Spindle Rotary Continuous Milling Machines

Among Heavy Machine Tools built by Consolidated are . . . .

LATHES
BORING MILLS
DRILL PRESSES
MILLING MACHINES
BORING MACHINES
COLD SAW MACHINES
BORING, DRILLING AND MILLING MACHINES
DRILL AND TOOL GRINDERS
PLANERS
SLOTTERS
RAILROAD SHOP TOOLS
AUTOMOTIVE TOOLS
AND OTHER SPECIAL MACHINES

BUILDERS OF HEAVY DUTY MACHINE TOOLS SINCE 1848

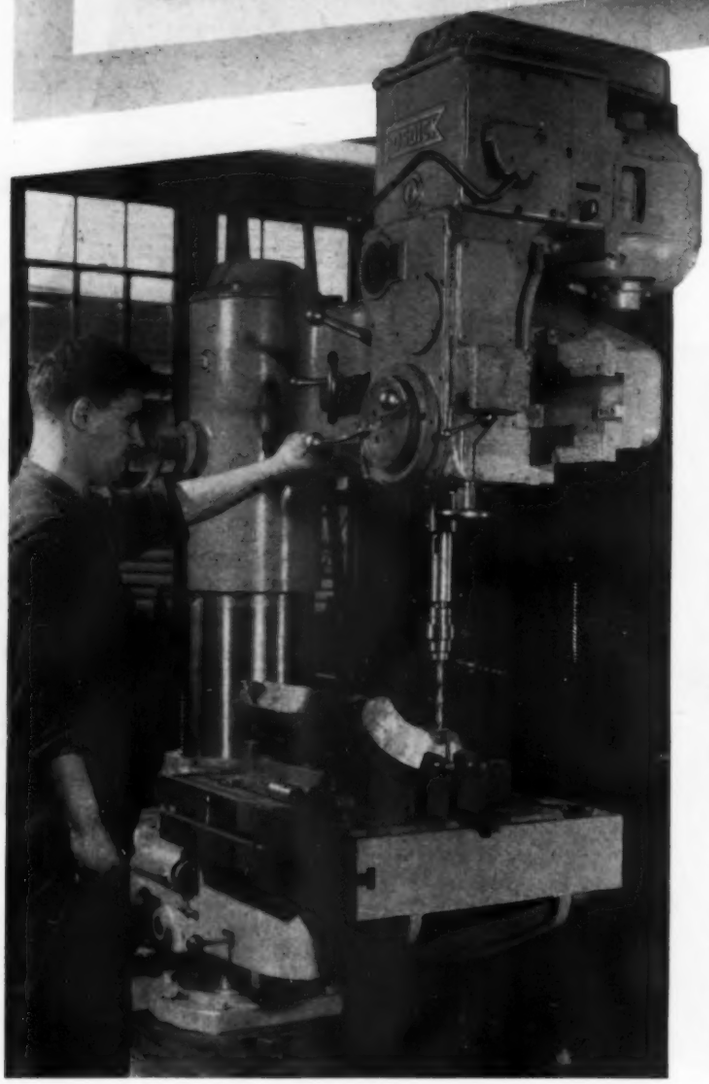
BETTS • BETTS-BRIDGEFORD • COLBURN • HILLES & JONES • MODERN • NEWTON • SELLERS

CONSOLIDATED MACHINE TOOLS

CONSOLIDATED
MACHINE TOOL CORPORATION

ROCHESTER 10, NEW YORK

Here's high speed sensitive drilling with radial drill convenience on the FOSDICK SENSITIVE RADIAL DRILL



● Presented to the metalworking industry a year ago this new Sensitive Radial is finding more and more uses in all types of manufacturing plants.

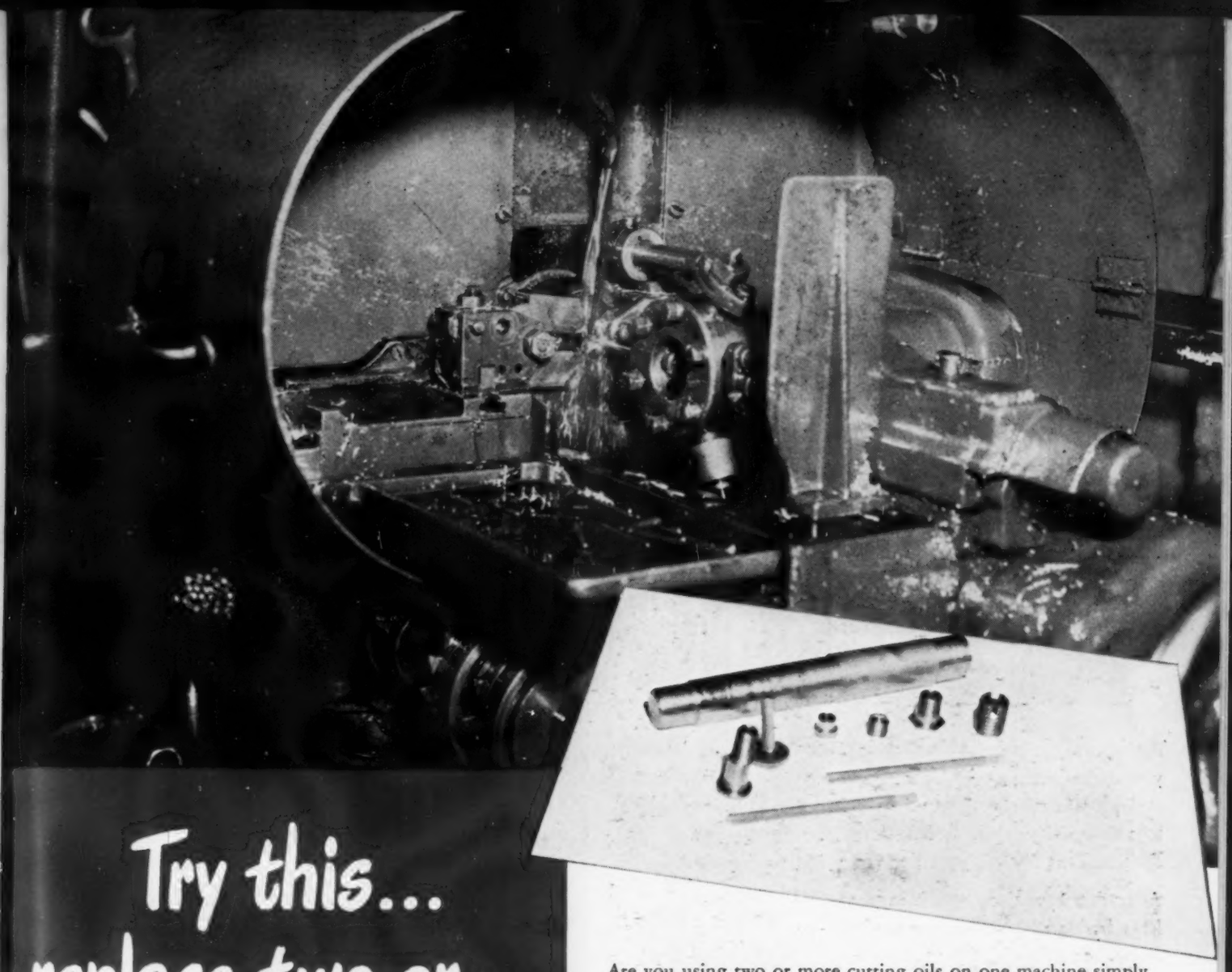
For example the machine illustrated is operating at Ball & Jewell Machy. Co., Brooklyn, N. Y. and is filling a long felt need for handling small work most efficiently.

The Arm is located at a fixed height and swings in an arc of 360°. The adjustable table, shown holding the work, raises and lowers on the column and also swings in a 360° arc. This is a distinct departure from conventional radial drill design but permits locating the table in the proper position for the job being worked.

This new Sensitive Radial offers many advantages for the economical production of holes up to 1½" diameter.

Write for the new Fosdick Sensitive Radial bulletin SRA for specifications and other pertinent information.

FOSDICK MACHINE TOOL *Company*
CINCINNATI 23, OHIO



Try this... replace two or more cutting oils with

Stanicut No. 137 BCS

Are you using two or more cutting oils on one machine simply because operations involve various metals and parts? If so, you may be losing production time needlessly by changing cutting oils between jobs. You are also running the risk of additional losses through misapplication of these cutting oils. Here is how a midwest machine shop avoided these difficulties.

This shop machines a large variety of parts, similar to those shown above. Materials include various alloys, brass, copper, and aluminum. Machining operations include turning, forming, threading, tapping, drilling and reaming. The problem of finding one cutting oil to handle successfully all of the jobs was turned over to a Standard Cutting Oil Engineer.

He recommended Stanicut No. 137 BCS. In three years' use, this multi-purpose cutting fluid has produced the required finish on all parts, with no staining of nonferrous metals. It has given uniformly good tool life on all operations. Materials and set-ups can be changed on the machines without taking time to shift cutting oils. Results: higher production of parts, no costly stocking of special cutting fluids.

You will find a Standard Cutting Oil Engineer helpful in improving machining economy and part quality in your plant. His wide experience with Standard cutting oils and coolants will prove to be a valuable aid in solving your particular cutting oil problem. Write Standard Oil Company (Indiana), 910 South Michigan Avenue, Chicago 80, Illinois.

STANDARD OIL COMPANY (INDIANA) STANDARD

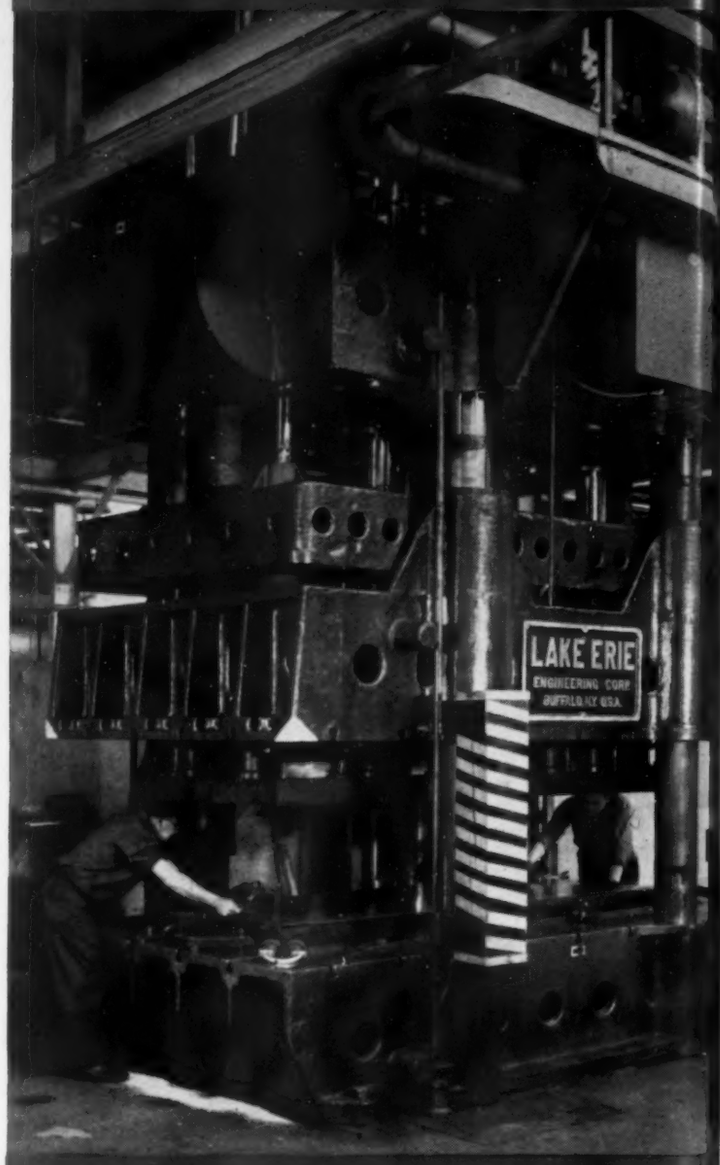
Why not use one oil for all your hydraulic systems?

STANOIL Industrial Oil

Are you using two or more special oils to take care of the various hydraulic operations in your plant? If so, you may find it profitable to shift to Stanoil. It has proved its ability to improve hydraulic operation through a wide range of service. Take for example these two different applications.

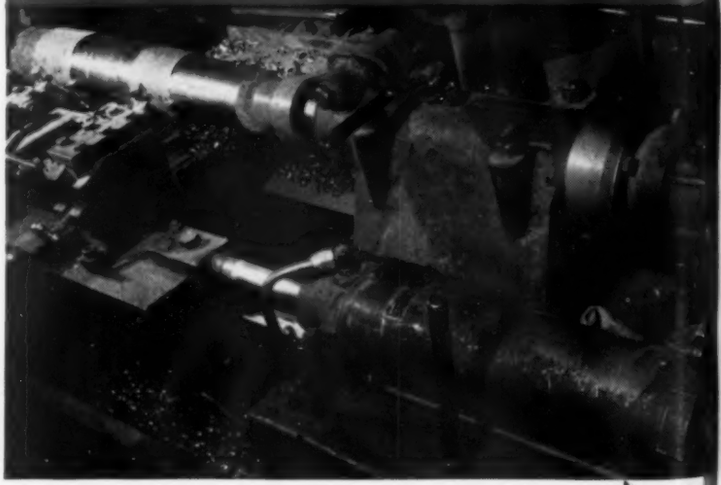
Greater Reliability

After three years' operation in the large hydraulic press, shown at the right, the original fill of Stanoil showed only a trace of oxidized oil and no appreciable change in viscosity. Because of the high stability of Stanoil, the hydraulic system stayed clean and the hydraulic controls functioned smoothly at all times.



Little Maintenance

A switch to Stanoil in the hydraulic feed mechanism, shown at the right, stopped varnish trouble and eliminated the frequent cleaning jobs required with the use of a conventional oil. Where previously the hydraulic oil had to be changed every three months, the original fill of Stanoil has shown practically no deterioration after three years of service.



Stanoil contains an oxidation inhibitor and an anti-foam additive that contribute to long oil life and clean, reliable operation of hydraulic units, speed reducers, and circulating systems. A Standard Oil Lubrication Engineer will help you put this economical oil to work in your plant. Write Standard Oil Company (Indiana), 910 South Michigan Avenue, Chicago 80, Illinois.

STANDARD OIL COMPANY (INDIANA)

STANDARD

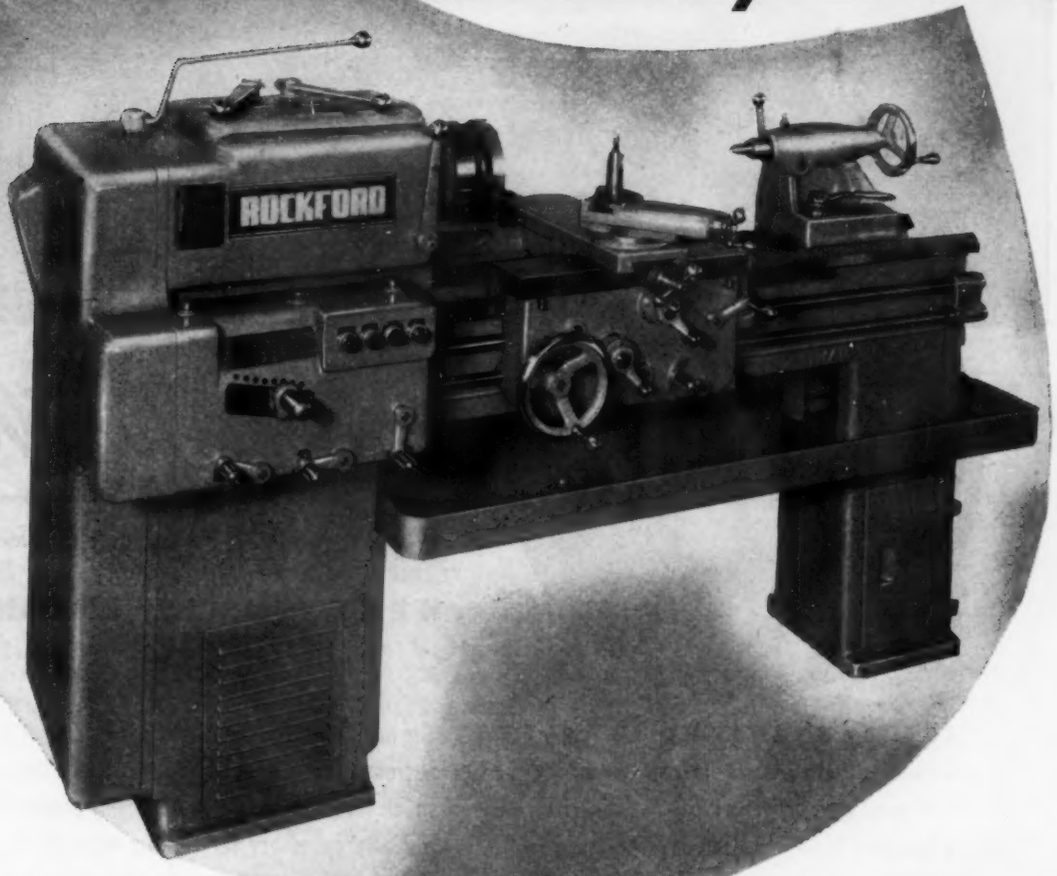
...BACK AGAIN!

Once more the Rockford Machine Tool Co. offers to industry the medium duty lathe that has been a favorite for production, maintenance, and tool room work for two generations.

metalworking's famous

ROCKFORD *Economy* LATHE

Re-introduced now, after more than two years of intensive work by skilled machine tool designers . . . the same men responsible for the world renowned Rockford Hy-Draulic Shapers, Planers, Slotters, and Shaper-Planers.



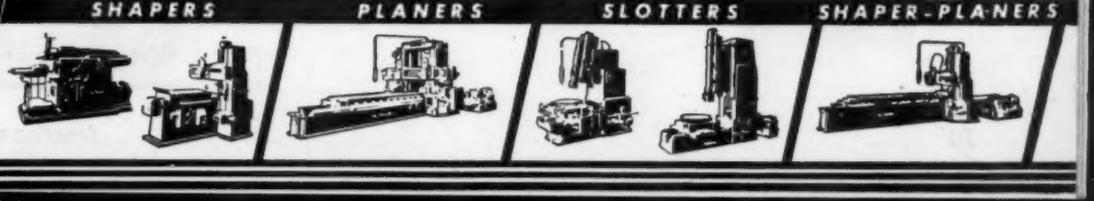
Completely redesigned from head to tailstock, the Rockford Economy Lathe provides outstanding lathe quality in the medium price field. It has every operating feature and all the precision required for good performance in the tool room or maintenance shop or on the production line. Whether you need a 14" lathe right now . . . or whether you'll not need one until sometime well in the future, may we suggest that you get all the facts to have them on hand for ready reference. Write for Rockford Economy Lathe Bulletin 462.

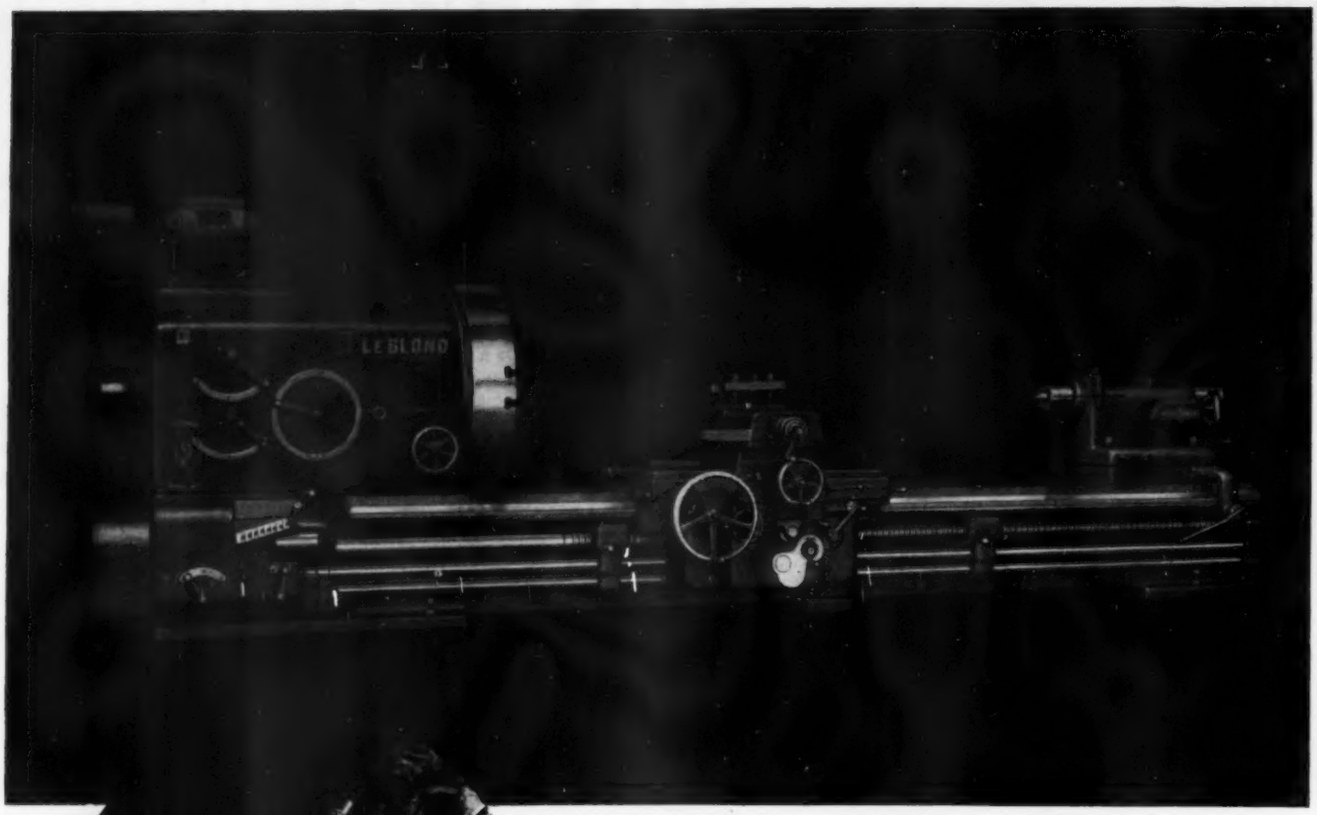
ROCKFORD MACHINE TOOL CO. • ROCKFORD, ILLINOIS

4814

ALSO MANUFACTURERS OF *Hy-Draulic*

REG. U. S. PAT. OFF.





Giants for Work . . .

THE 40" AND 50" LEBLOND HEAVY DUTY ENGINE LATHES

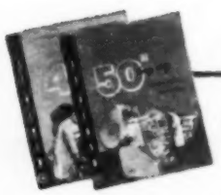
40"-50" STANDARD FEATURES

- Feed box totally enclosed, lubricated automatically.
- 27-speed geared headstock.
- Periphery-driven face plate . . . 18 speeds.
- Hardened and ground steel bed ways front and rear.
- Power rapid traverse moves carriage effortlessly.
- Power angular feed to compound rest.
- One-piece apron with positive jaw feed clutch, lubricated automatically.
- Apron electric control starts, stops, and reverses spindle.
- Thrust lock tailstock with worm and rack construction.

Big lathes for big jobs. Gigantic in size, yet these powerful lathes are extremely easy to operate . . . produce the accuracy associated with much smaller LeBlond lathes. They present the capacity, power, and stability necessary for turning work of huge proportions. Smartly engineered, ruggedly constructed, they will produce with precision for years. Send for complete information today.

THE R. K. LEBLOND MACHINE TOOL COMPANY, CINCINNATI 8, OHIO
LARGEST MANUFACTURER OF A COMPLETE LINE OF LATHES

New York 6, Singer Bldg., 149 Broadway, COrtlandt 7-6621-2-3.
Chicago 6, 20 N. Wacker Drive, STA 5561.
Philadelphia 40, 3701 N. Broad St.. SAgamore 2-5900
Detroit 2, Mich., New Center Bldg., TRinity 3-5561



Get your copies

of new illustrated bulletins describing the 40" and 50" LeBlond Heavy Duty Engine Lathes.

LEBLOND

ARMSTRONG

ARMALOY

Drop Forged

WRENCHES

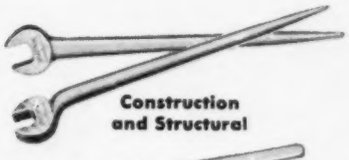
ARMSTRONG ARMALOY — Wrenches are NEW. They are designed to meet the requirements of the mechanic who knows his tools and insists on using tools of Superior Quality.

ARMSTRONG ARMALOY — Wrenches are made from selected grade alloy steel. They are longer, lighter, thinner, yet stronger than the conventional alloy wrenches—heat treated to exact specifications of stiffness and tensile strength—better balanced, hence easier to use. Finished in chrome plate with heads buffed bright.

Armstrong Tools are stocked by leading tool departments.

Combination

Box Socket



Construction and Structural

Hex Box

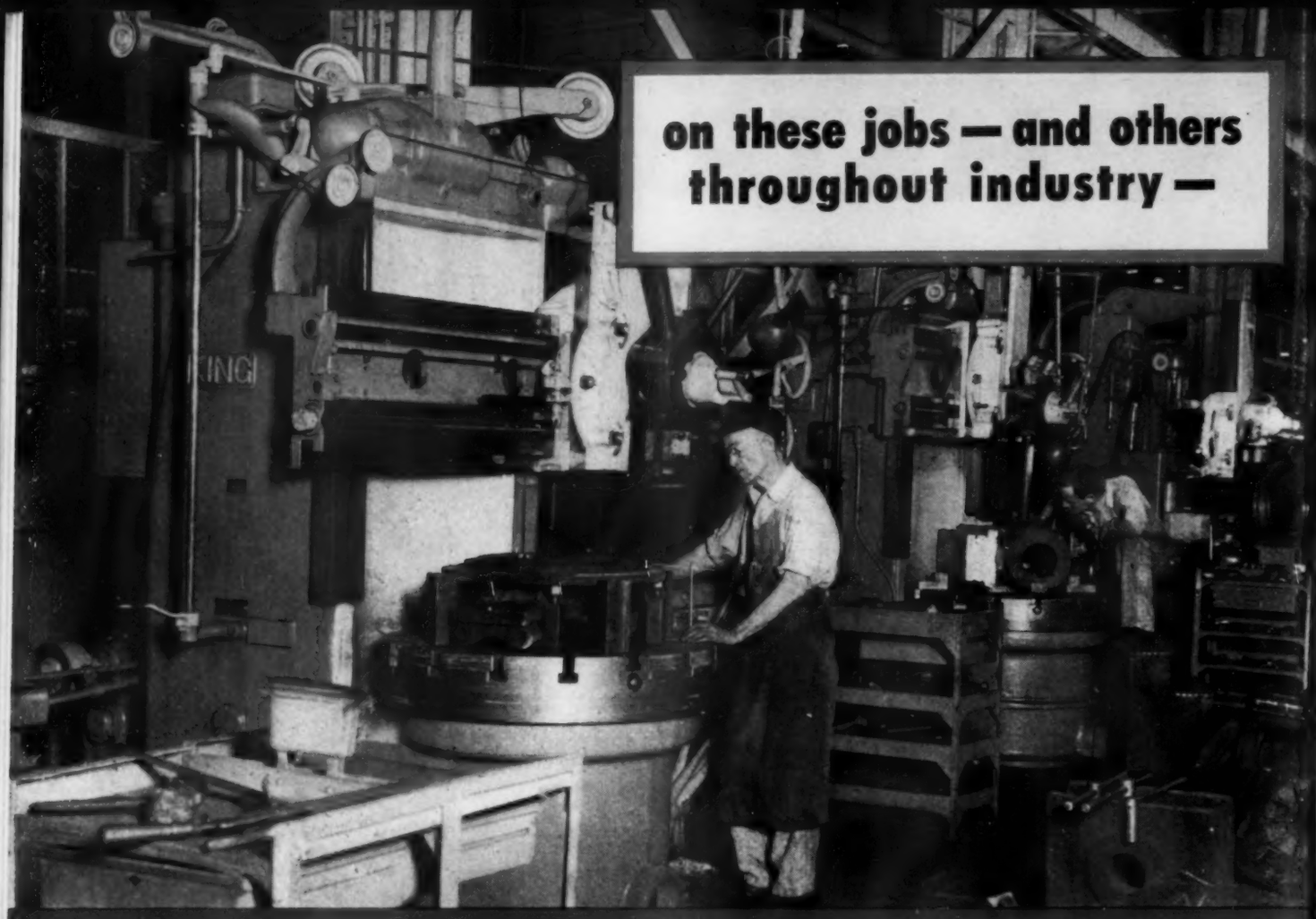
Reversible Ratchets

Detachable Sockets and Sets

ARMSTRONG BROS. TOOL CO.

"The Tool Holder People."

5215 W. Armstrong Ave. Chicago 30, Ill.



on these jobs — and others throughout industry —

KING VERTICAL BORING & TURNING MACHINES *Pay Profits!*

Here are two 42" King Vertical Boring and Turning Machines busy turning out a wide range of production in one of the major shops of a prominent railroad. In addition to the cylinder head and crosshead shown being turned and bored, other jobs that are put on these versatile King machines include piston and cylinder plate castings, bearings, hub liners, cylinder bushings, boxes of all kinds, packing rings, and many other locomotive parts.

Throughout industry King Vertical Boring and Turning Machines are kept busy *all* the time, for they have the *built-in* ability to take on a wide variety of jobs and turn out the work fast, accurately, and at reduced costs. Modern machine tools are a sound investment. Consult a King engineer on your boring and turning requirements. It costs you nothing—and it can help you pave the way for substantial savings in easier, faster, and better production.

The New Series KING

Single column machines, 30", 36", and 42" swing. Double column machines from 52" to 144" swing. All available with or without side head. Write for bulletins giving complete specifications on size machines that meet your work requirements.

American Steel Foundries

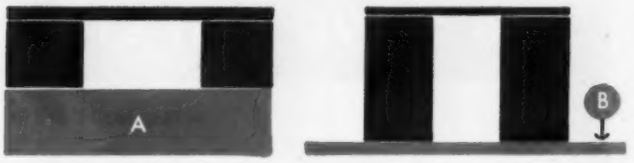
KING MACHINE TOOL DIVISION

CINCINNATI 29, OHIO

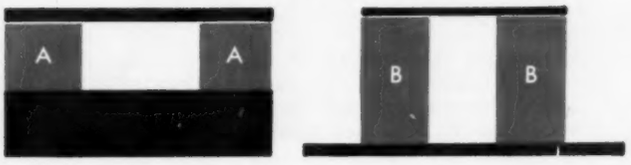
Builders of King Vertical Boring & Turning Machines and Sebastian Lathes

Choose "A" or "B"
TOOLING AREA
(Work and Tool Axis)

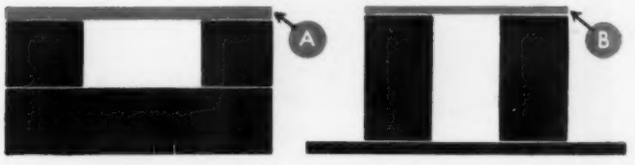
Choose "A" or "B"
BASE SUPPORT



Choose "A" or "B"
UPRIGHT SUPPORTS



Choose "A" or "B"
TOP SUPPORT



HOW GOOD ARE YOU ON MACHINE DESIGN?

The all-round efficient service given by any machine tool, and the opportunity for its improvement and development, usually depend on advantages afforded by its basic design. Before purchasing a machine it will pay to look for the advantages or disadvantages of its basic design.

	MACHINE #1*	MACHINE #2	MACHINE #3	MACHINE #4	MACHINE #5
WORK & TOOL CAPACITY	✓				
WORK & TOOL SUPPORT	✓				
WORK & TOOL MAINTENANCE	✓				

*CONOMATIC

Any good investment has certain qualifications that prove it profitable. The wise investor and smart banker have some sort of measuring stick to analyze every investment they make.
Why not use a measuring stick to chart your purchases of Automatic Bar Machines? If you are already using a chart, perhaps you would like to compare it with the one that we have prepared. Write to us for a copy or ask the Cone representative.

Above are illustrated two types of frame design of Multiple Spindle Automatic Bar Machines. Assuming that the Tooling Area is important — and is as efficient as the frame around it permits — which of the two designs would you choose to meet the following requirements?

WORK & TOOL CAPACITY

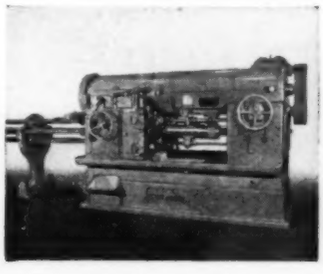
Long, open, roomy Tooling Area and long main end slide for handling longer work and for clearing die heads in threading, etc., to the full collet capacity of the machine; for heavy cross-slide cuts, deep hole drilling, and general all-round work with HSS or Carbide Tools.

WORK & TOOL SUPPORT

Genuine, horizontal, rectangular box-frame, free of overhang; heavy-set, rigid upright members for supporting head-stock and gear box units between heavy, full-length top and base members, for substantial support of all work and tools close to the work and tool axis, and for the maintenance of accurate alignment of work and tools.

WORK & TOOL MAINTENANCE

Heavy, strong, well supported, overhang-free, vibration-free, liberal bearing, convenient, adjustable, work holding units and tool slides, with accessible chip-free cams, with adequate capacity in base member for chip disposal and cutting coolant.

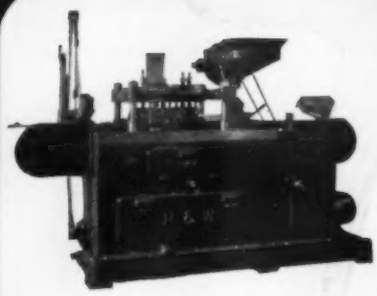


A comparison with ALL Automatics will lead you to

Conomatic

CONE AUTOMATIC MACHINE COMPANY, INC.
WINDSOR, VT., U.S.A.

How H & W DIEING MACHINES may save you 50% to 90% of STAMPING PRODUCTION COSTS



PRIMER- INSERTING

A difficult problem is met by this machine, at great savings, performing 7 operations complete-per-stroke, including varnishing.

Reported Savings of Complete-per-stroke production on Special Dieing Machines

While regular models of Henry & Wright Dieing Machines bring Complete-per-stroke economy to the majority of stamping operations, a substantial part of our production is special machines for intricate stamping and assembly operations giving present users:— Savings of 60% to 90% of production cost. Gains in die life of 600% to 1200%. Savings of 50% to 90% in plant space. Precision of product held to within .0002" limits when required, with sharp, clean edges. Safeguarding of expensive carbide dies against chipping. Special machines are producing and assembling these typical jobs:

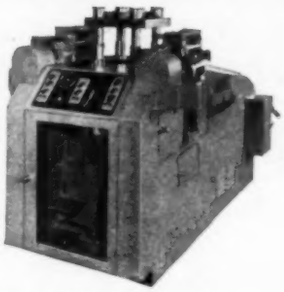
RADIATOR TUBE AND FINS • CARBURETOR SUB-ASSEMBLIES ROTOR LAMINATIONS • BOOSTER SHELLS AND DISCS • HEAT TRANSFER FINS.

Bullet assembly and primer inserting have been successfully handled on Dieing Machines at savings approaching 90%.

168,000 pieces per hour with the *SPEEDMASTER*

The Speedmaster adds to complete-per-stroke Dieing Machine advantages.

A patented system that eliminates vibration, enabling the machine to OPERATE OVER ITS ENTIRE SPEED RANGE WITHOUT BEING BOLTED TO THE FLOOR. Centralized Variable Speed Control. Automatic Lubrication to all required points. Centralized Controls. Scrap Cutter actuated by crankshaft. Water-cooling of oversize roll feed brakes. Brake Synchronizer assures top-of-stroke stopping. SPECIAL DIES NOT REQUIRED. Gives the speed range suitable for carbide dies. "Precision-guiding" assures safe operation and maximum life. Write for further details.



E and I laminations 84,000 of each produced per hour; .0007" silicon steel.

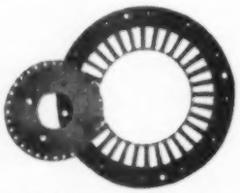
The "STANDARD" Produces 1-20 Stampings Complete-per-stroke

A unique "upside-down" principle of construction gives Dieing Machines a low center of gravity, with resultant freedom from vibration. Pulling the upper crosshead downward by four alloy steel rods "precision-guided" in adjustable taper bushings, further contributes to amazing smoothness at high speeds, and precision of action. Standard Dieing Machines using progressive dies produce 1 to 20 stampings complete per stroke at speeds up to 600 s.p.m. Capacities: 10 tons to 300 tons.

Brass carburetor part produced complete per stroke 70 per minute with 1⅛" draw and 3 piercings.

Can opener blade requiring 8 operations produced complete per stroke at greatly increased rate.

Eight operations at every stroke produce 4800 completed shells per hour including 1⅞" draw.



Motor rotor and starter laminations produced simultaneously from same strip of .025" silicon steel.

REQUEST CATALOG 48

HENRY & WRIGHT MFG. CO.

483 WINDSOR STREET HARTFORD, CONN.

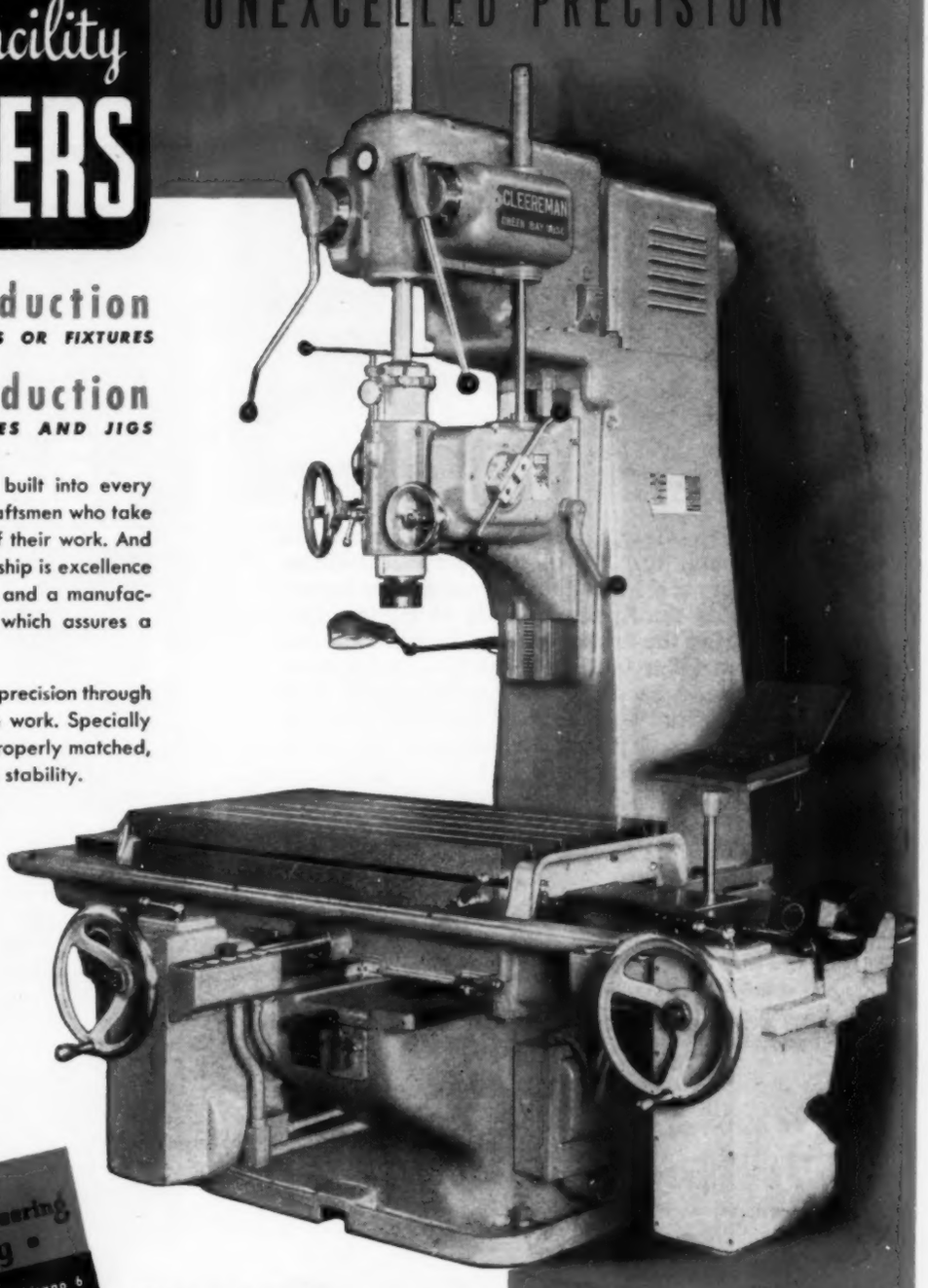
HENRY & WRIGHT DIEING MACHINES

CLEEREMAN

UNEXCELLED PRECISION

PRECISION with STAMINA and *Operating Facility*

JIG BORERS



Small Lot Production

WITHOUT LAYOUT TIME, JIGS OR FIXTURES

Tool Room Production

OF ACCURATE TOOLS, DIES AND JIGS

UNEXCELLED PRECISION is built into every Cleereman Jig Borer by skilled craftsmen who take a personal pride in the quality of their work. And behind their exceptional workmanship is excellence of design, exacting specifications and a manufacturing technique and procedure which assures a precise machine tool.

STAMINA maintains this in-built precision through a long life of extremely accurate work. Specially processed and tested materials, properly matched, combat wear of ways and secure stability.

OPERATING FACILITY has long been accepted as characteristic of all Cleereman machine tools. Convenient, time saving grouping of controls aids appreciably in producing more work. Prepositioning power rapid traverse or electronic traverse and milling control accessories speed operation.

WIRE OR WRITE for catalog with complete specifications.

Address —

1908 - 1948 40th Anniversary CLEEREMAN MACHINE TOOL CO.

BRYANT Machinery & Engineering Company

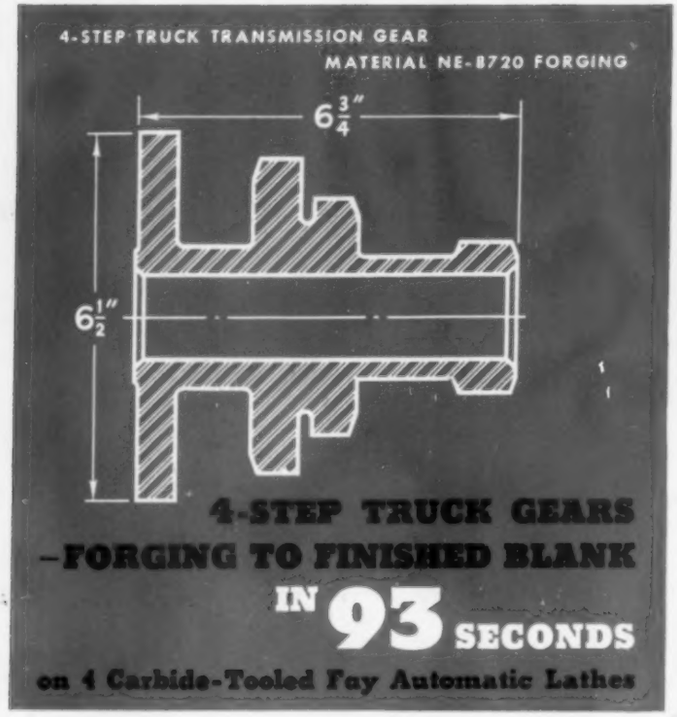
General Office
400 West Madison Street, Chicago 6
Representatives in Principal Cities

Affiliated with—

CLEEREMAN MACHINE TOOL CO. Green Bay, Wis.

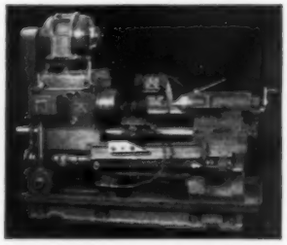
BUILDERS OF PRECISION JIG BORERS AND DRILLING MACHINES

DO YOU COMPETE AGAINST PRODUCTION LIKE THIS ?



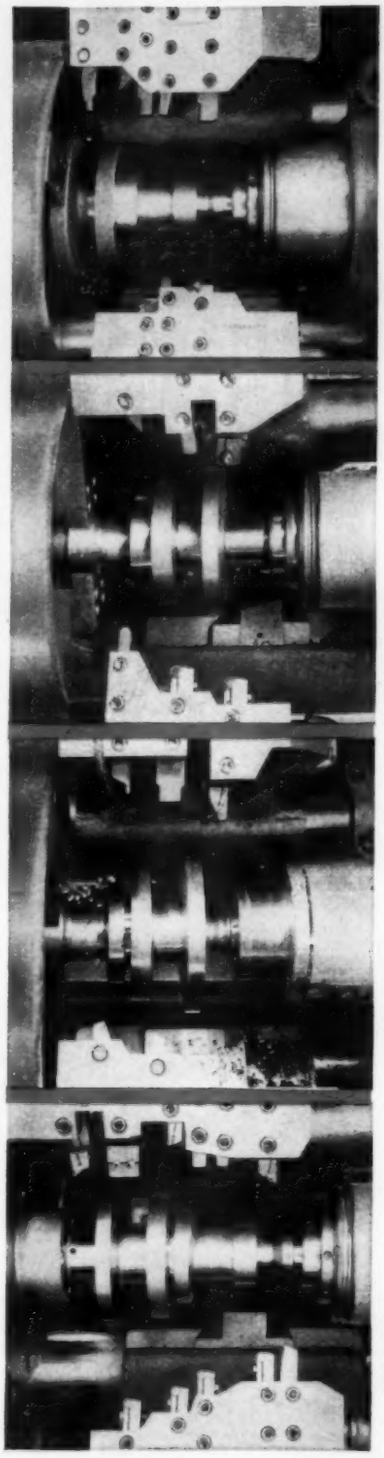
This 4-operation gear job is a striking example of production turning on the Fay Automatic Lathe. Every tool has either a brazed or an insert-type carbide tip. Approximately 68 HP is transmitted during the first operation! Surface speeds range from 450 to 660 FPM. The blanks are completely turned, faced, formed and grooved, with every important surface held true and concentric . . . Moreover, these 4 machines are doing the work formerly done by 17!

Why not write us for more details? Let us show you why it's cheaper to own a Fay than to compete against one!



Our new 16" Fay Catalog contains many other examples of high production turning. Write to Dept. 710F for your copy.

DESIGNED To lower every turning cost. ***BUILT*** For maximum production with either carbide or high speed steel tools. ***POWERED*** To produce more chips per tool, more pieces per hour, more profit per job . . . than any automatic lathe of comparable range.



24 SECONDS 1st operation

28 SECONDS 2nd operation

18 SECONDS 3rd operation

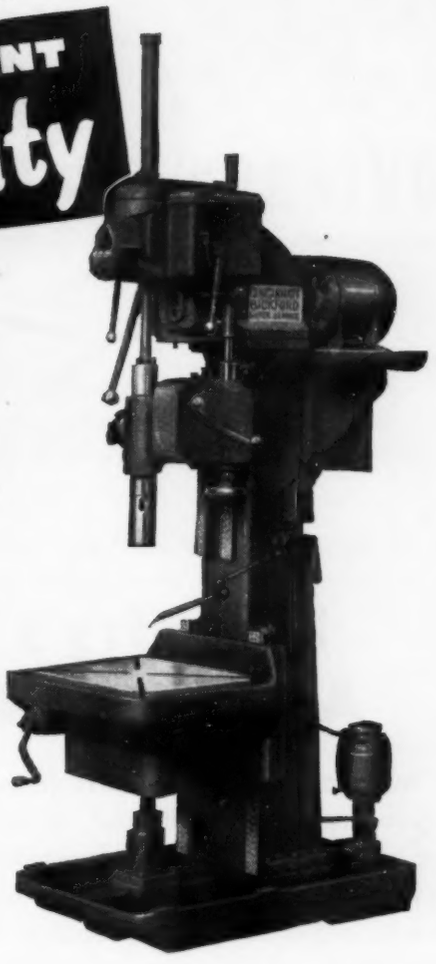
23 SECONDS 4th operation

Fay Lathe Division

JONES & LAMSON MACHINE COMPANY
Springfield, Vermont, U.S.A.

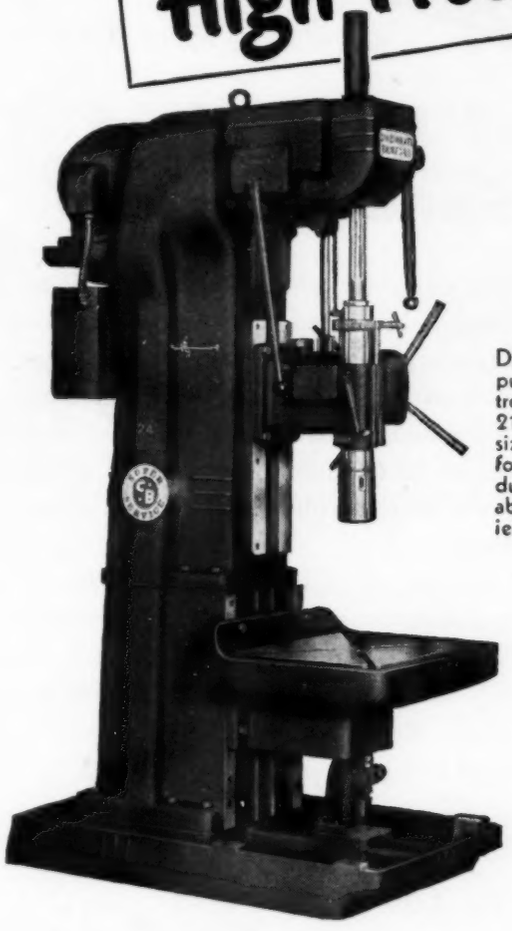
MACHINE TOOL CRAFTSMEN SINCE 1835

WHEN YOU WANT Versatility



WHEN YOU WANT High Production

All geared, sturdy, accurate and versatile, furnished in 21", 24", 28" sizes. Built in both box type and round type to suit the particular need.



Direct Drive, with push button control of motor—in 21", 24" or 28" sizes. Simplified for low cost production, yet adaptable and convenient.

Opportunity of selection means increased value to the buyer—the power to select exactly the machine suited to the particular job.

Cincinnati Super Service Upright Drills are built in production, and all geared types—one for high production, and on the other, versatility of performance.

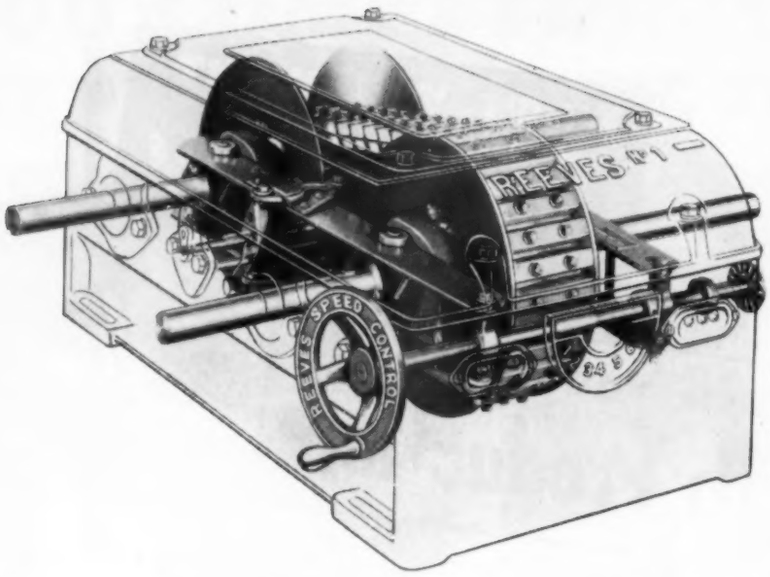
Both types of these modern, up-to-date upright drills are sturdy, fast and rigid. They give long, trouble-free performance, and assure the user "low cost per hole."

Write for bulletin U-27 (Direct Drive Production Super Service Uprights) and bulletin U-25 (All Geared Super Service Uprights).

THE CINCINNATI BICKFORD TOOL CO.
RADIAL AND UPRIGHT SUPER SERVICE DRILLING MACHINES
Radials 7½" dia. col., 2½' arm, to 96" dia. col., 12' arm.
General purpose Uprights, 21" to 28" sizes.
Production Uprights, 21" to 28".
Jig Borers, Portable Horizontals, Spacing Table Machines.

Equal Efficiency of Every Unit Makes the Balanced Machine

THE CINCINNATI BICKFORD TOOL CO. Cincinnati 9, Ohio U.S.A.



Industry's Approved Method of Accurate, Variable Speed Control

The "missionary" work for variable speed control has been done. On every hand, in every industry where operating conditions are subject to change, there is abundant evidence to support its claims for increased output, improved, uniform quality and reduced cost.

Your problem, then, is one of selection . . . of determining which type and make of variable speed drive is best for your particular need. In making that choice, consider these facts about infinite, stepless REEVES Speed Control:

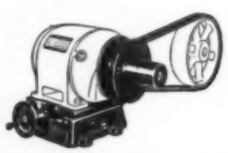
Manufactured by a company with more than fifty years' specialized experience in this specialized field. Design based on a proved operating principle. Ruggedly constructed for trouble-free operation and easy maintenance without special training or tools. Offered in a complete range of sizes, capacities and speed ratios, and furnished with any type of control . . . easily incorporated in new machine designs or applied to existing machines. Performance-proved in 260,000 installations and provided as standard equipment in 2,100 different makes of machines. Backed by a nation-wide engineering and service organization.

Think it over . . . this broad background of experience, this documented evidence of efficiency on any and all jobs . . . and we believe you will understand why REEVES is Industry's approved—*and proved*—method of variable speed control. Write for copy of 114-page catalog, A11-450A.

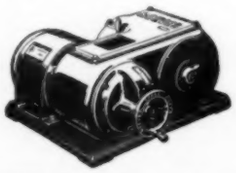
REEVES PULLEY COMPANY • COLUMBUS, INDIANA

THE THREE BASIC REEVES SPEED CONTROL UNITS

VARIABLE SPEED TRANSMISSION for providing infinite, accurate speed flexibility over a wide range—2:1 to 16:1. Sizes—fractional to 87 hp.



VARI-SPEED MOTOR PULLEY converts any standard constant speed motor to a variable speed drive within 4:1 ratio. Sizes to 15 hp.



MOTODRIVE combines motor, speed varying mechanism and reduction gears in single compact unit. Speed variations 2:1 to 6:1 inclusive. Sizes to 15 hp.

Accurate Variable

REEVES Speed Control

Gives the Right Speed for Every Job!

SPOT NEWS OF METALWORKING

Stepped-up production programs are underway in the Army Ordnance Department's seven manufacturing arsenals, including filling depleted ammunition categories, installing pilot assembly lines for items the arsenals have not made before and development work on new Ordnance materiel.

About 10,000 machine tools a year probably will be required to retool the aircraft industry for the 70-group Air Force program. The total thus will be far below the figure of 268,000 units mentioned at Wright Field in May.

Steel mills are cutting down sharply rail shipments to customers because of higher freight rates. One company now ships only 60 percent of its tonnage by rail, as against 85 percent only two years ago.

Draft officials have dropped idea of protecting skilled workers under present program. Reason: too few who are in the 18-26 age limit. Firms will have to deal directly with local draft boards if they desire to protect individuals.

Dispersal of new plants outside industrial areas, rather than underground construction, is now emphasized by NSRB and the military. Wanted: manufacturers to plan new buildings with no other important industrial installation within a three-mile radius. Construction in rural areas, however, still preferred.

Reconditioning of approximately 2,000 B-29s still in moth balls for tactical operation use is now planned by the Air Force. There are no more B-17s or B-24s left for overhaul.

Per-man coal production in Britain is slowed down at present by installation of new and modern machinery, which interferes with straight mining operations. This situation is expected to be rectified before long.

Brazil is permitting companies and cooperatives striving to increase the mechanization of farming to import machinery duty-free and tax-free. The government will finance the purchases on long-term four percent loans.

Employment at Boeing Airplane Co. plant, Seattle, Wash., is expected to exceed pre-strike total of 18,500 as the result of military contracts.

All but $123,000 of the $2,104,111 in machine tools authorized by ECA for ERP countries during the first six-month period will be purchased in the United States. Engines and turbines approved total $995,000 and metalworking machinery (excluding machine tools) $1,208,181.

France is buying machine tools in Britain, after having cancelled some of the long-standing orders for U.S. machines for which the French government refused to grant necessary import licenses and dollars.

Entire industrial plants are being fabricated in Italy and shipped out to other European countries. Poland is one of the customers.

Gaging Metalworking

Though the pipeline between manufacturer and retailer is being filled rapidly and some curtailment looms in certain consumer lines, metalworking operations in general promise to stay at or near today's level.

That level is 2.1 times the 1939 volume, measured by the AMERICAN MACHINIST index of metalworking production. The index is based on manhours worked.

The truth is that a number of lines still are amazingly tight. To name only several: automobiles, auto parts as original equipment, cans, heavy electrical equipment, machinery (farm, mining and roadbuilding), oil and railroad equipment, television.

Construction Mounting

Look at construction. Ignored on the value of materials and on-the-site cost of roads, dams, buildings and other projects, construction will add up to a total of $18.5 billion this year. On top of that, some $8 billion is being spent on materials and manpower for maintenance of existing structures.

This whopping load of $27 billion may be even bigger in 1949. At the worst, it is not likely to decline much. In home building alone, a million units a year for another year or two is still probable. Public works appears destined to jump about $1 billion next year to a high mark of $5 billion.

Industry Holding Steady

Economists of the U. S. Department of Agriculture, who have made a solid reputation as good forecasters, predict that industrial production the first half of 1949 will average 192 (with 1935-1939 taken as 100). That is exactly the estimate for the final half of this year.

The two most uncertain factors to be reckoned with are the defense program and ERP. It appears that defense requirements will gain slowly but surely as some form of military lend-lease to western European countries develops. The amount of capital goods moving to that sector under ECA sponsorship seems likely to increase.

Metalworking Output Up

It is a safe guess that the AMERICAN MACHINIST index of metalworking production, which bounced up to 222 in September from 219 in August, will stay at its recent level. All five components of the index moved upward in September, a sweep which indicates how solidly and how widespread the boom is in metalworking. Electrical manufacturing, for example, rose six points. Automobiles and trucks went up three points.

Non-Ferrous Markets Tight

The non-ferrous metals market continues to be one where demand exceeds supply, and little relief is expected before 1949, if then. Lead supply is still very critical and there is consistent talk of a price increase. The zinc market continues tight, particularly in the special classes such as prime Western, brass special and special high grade.

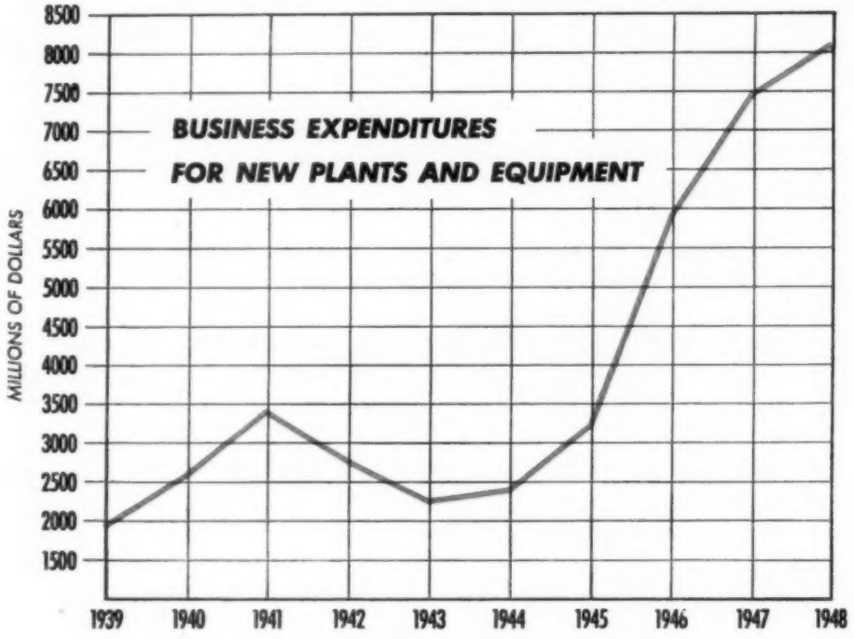
Tin prices are expected to be hiked between now and the end of the year as the supply situation remains one necessitating continuation of controls for a considerable period of time.

Despite rumors and talk of the aluminum market loosening up, there is no hope for improvement during this year or the next, according to major producers. Even the Canadian supply is becoming more critical with power shortages and the continued drought.

About the only bright spot in the picture is in nickel where the supply situation has somewhat improved in the face of heavy demand.

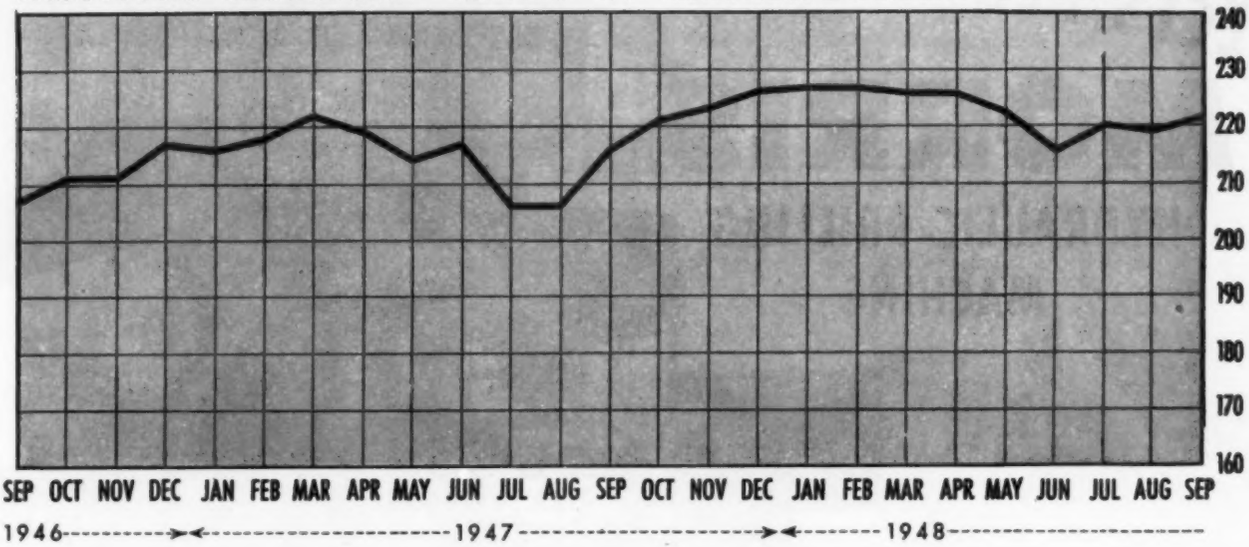
Indications of an even tighter copper market next year have brought unconfirmed rumors of another increase in price before the end of the year. Stockpiling and continued demand in domestic industries, as well as the result of ERP, are reasons advanced to indicate future shortages. Heavy pressure has been put on wire mills and the situation appears to be worsening.

Domestic aluminum production, however, continues to run along at a high rate. September output hit 106,508,723 pounds but his was more than 3 million pounds less than August. Shipments of sheet, plates and strip mounted from 101,842,864 in August to 103,159,709 pounds in September. The industry expects to produce by the year-end around 1 billion, 200 million pounds, the highest figure with the exception of the peak war years. Continued shortage of low-cost power is blamed for the industry's failure to reach capacity output.



1948 Figure Estimated

American Machinist INDEX OF METALWORKING PRODUCTION



INDEX		COMPONENTS				
		MACHINERY	ELECTRICAL MFG.	AUTOS, TRUCKS	TRANS-PORTATION EQUIP.	OTHER METAL-WORKING
Sept. 1948.....	222	249	231	227	308	154
Aug. 1948.....	219	247	225	224	306	146
Sept. 1947.....	216	240	234	225	268	145

AMERICAN MACHINIST'S INDEX OF METALWORKING is based on manhours worked in five segments, which are "weighted" as follows: Machinery, 32.5—Auto & Trucks, 22.6—Electrical Manufacturing, 15.4—Transportation Equipment, 12.4—All Other Metalworking, 17.1 Index figures are a percentage of 1939, which equals 100.

Steel Shortage Continues

With steel ingot output pushing full capacity, the steel industry still is unable to keep up with the demand. With the continuation of sheet and strip allocations, the scheduling of mill shipments to consumers has become harder. It is almost impossible at this point, for instance, to say what tonnage any specified user will get during the first quarter.

Plates, some 30% of which are on voluntary allocation, are critical. Hot-rolled carbon bars, structural steel, wire, nails and pipe also are under a quota system. A big demand exists for sheets more than 72 in. wide; they are used in automobile manufacturing. And only three mills can supply these sheets.

Scrap Cause of Worry

Pig iron and steel are a constant source of worry. Prices of pig iron are up $3 to $4 a ton. The situation is made worse by the fact that furnaces here and there are shutting down for repairs. The scrap supply is becoming increasingly contaminated; that creates a real problem for the mills.

Conversion deals are going strong. No change is looked for in the next six months. If the defense program should expand at all, steel promises to get tighter than ever.

Machine Tool Orders Off

New orders for machine tools stayed during September at about the same level as in August and July. But the index figure for that month (73.1) was substantialy below the June figure of 83.4. The year's peak to date came in March and April, when the order index hit 86.3 (with average shipments in 1945-1947 taken as 100).

Foreign orders, stymied by dollar shortages round the world, declined to 11.6 of total business, not much above half the normal export sales of the industry prior to the war.

Shipments Up Sharply

Shipments took a sharp jump in September to 84.7, from 69.8 during August. In fact, the month turned out to be the third largest of the year. The result of the poor record in orders and the increase in shipments was a further fall in the ratio of unfilled orders to shipments. It is now 4.3 to 1.

Never have machine tool builders, except in wartime, had out so many quotations. The same old story applies to the industry—one company is doing a very satisfactory volume, and another is hungry for work. On the whole, companies with special or semi-special machines are doing more business proportionately than those sticking to general-purpose tools.

Defense Needs 10,000 Units

The defense program is shaping up slowly so far as machine tools are concerned. The number of machines to be bought is roughly estimated to be 10,000 a year for the next several years. That means an outlay of $60 million to $85 million a year.

Delays in placing defense orders for machine tools are traced to: (1) ruling of Air Force that all possible work must be subcontracted by the prime contractor; (2) slowness of Washington executive departments in approving equipment purchase programs quickly cleared by the Air Force at Wright Field; (3) combing of Janmat reserves for all suitable surplus machines before a decision is permitted on the buying of new equipment.

Westinghouse Has Big Program

It is known that Westinghouse has a jet engine program ahead which calls for new machine tools running into millions of dollars. Bids have been asked for on some of this equipment, and Westinghouse is on the verge of placing it. Some subcontractors also are in the market for tools for jet engine manufacture.

A substantial amount of the pending business for automotive transmissions for '49 has been ordered by General Motors divisions and by Packard.

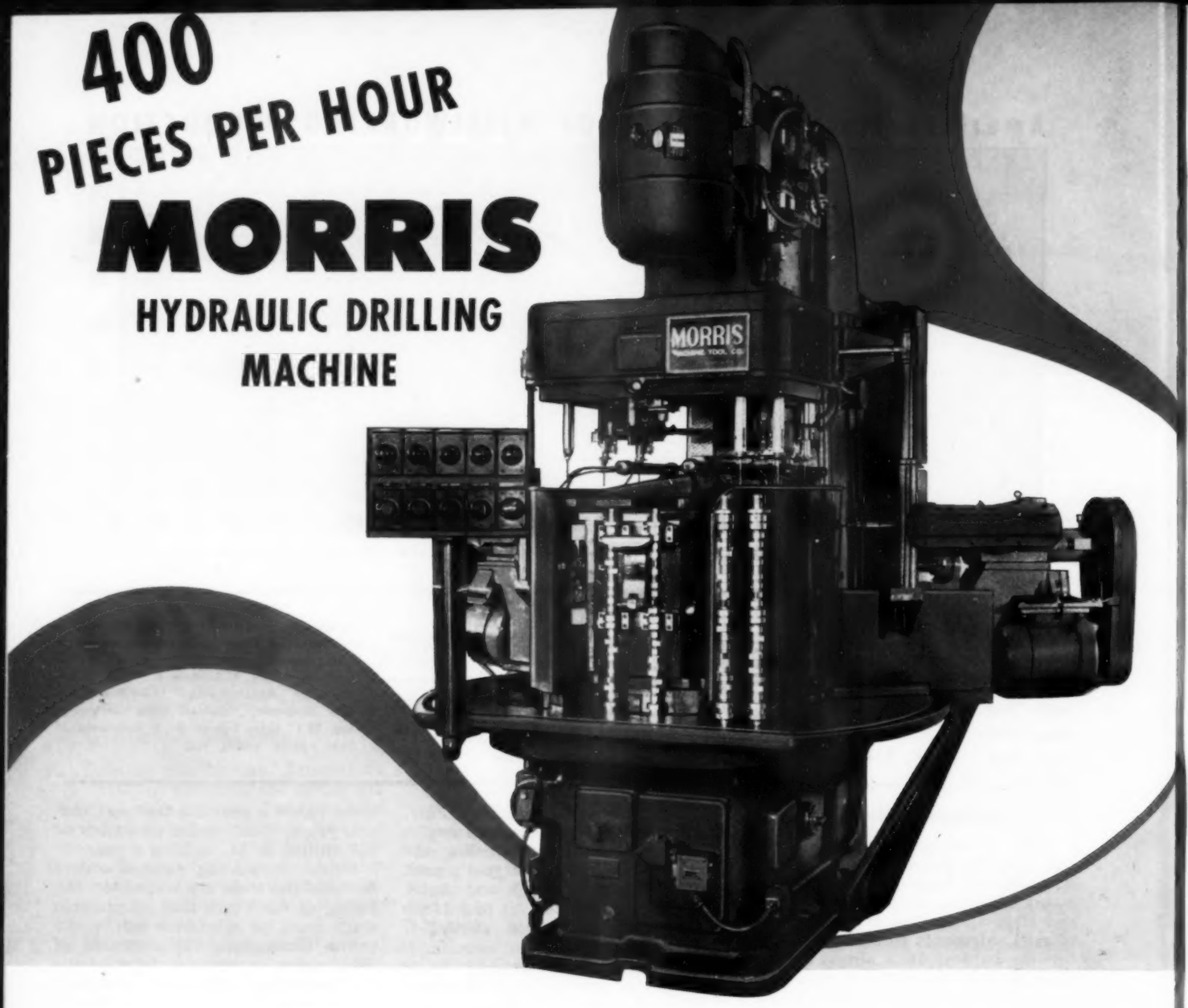
Gear Sales Dip

Volume of sales in the gear industry dipped 4.53% in September below the August mark. Turbine or propulsion gearing is not included in this figure. The September Index of the AGMA was set at 320.4 as compared with 324.93.

400 PIECES PER HOUR

MORRIS

HYDRAULIC DRILLING MACHINE



● Many manufacturers faced with the problem of rising costs are using Morris Mor-Speed Production Machines to increase production and keep costs down in order to compete in today's market.

For example the machine shown is a Vertical Hydraulic Drilling machine used to drill oil holes in the end of cam shafts and connecting hole from the side simultaneously.

Operation is comparatively simple as the machine has six indexing stations—two pieces are unloaded and new work inserted in the hand controlled fixtures during the operating cycle. Production is continuous at the rate of 400 pieces an hour. Indexing is automatic.

The four rear vertical spindles are controlled by micro switches and are collapsible in the event hard spots are encountered or a tool breaks.

If you are interested in high production work handled most economically investigate Morris. They have the experience and engineering "know-how" to help you on your high production jobs.

Write for details.

Builders of MOR-SPEED Line

The MORRIS Machine Tool Co.

CINCINNATI 3, OHIO

American Machinist

MAGAZINE OF METALWORKING PRODUCTION ★ ESTABLISHED 1877

Incentives Help Productivity

Productivity is rising again. By productivity, we mean output per manhour.

It got a serious setback during the war. The steady upward trend in productivity during the 1930's came to a halt and then declined during the war years.

Now it is coming back up. In some cases, it has regained its prewar status; in a few notable instances, it is higher than before the war.

Recent gains do not necessarily indicate that employees are working as hard as they did a decade ago. There is no exact measure of their efforts, anyway.

The prevailing impression is that up to now more of the improvement in productivity can be traced to increased mechanization and to better plant layout than to the human element.

An important job still is to be done in instilling into machine operators and other production employees the desire to turn out more work.

And that brings us to the problem of wage incentives. In proper and efficient use of such incentives lies an opportunity for employees to produce more and to be rewarded accordingly.

Prior to World War II many incentive systems came into disrepute. Many shops gave them up altogether during the war. And labor in general was opposed to them.

Great progress has been made since the war, however, in establishing well-operated and eminently fair wage incentive systems. For one thing, more accurate time studies and the better setting of jobs have helped.

Incentive systems, as a result, are beginning to flourish. That is a good sign from the standpoint of productivity.

It means that productivity should rise further. Only the combination of skilled mechanization, efficient plant layout, continuous and smooth flow of materials and parts, and the willingness of employees to do a job can spell top productivity.

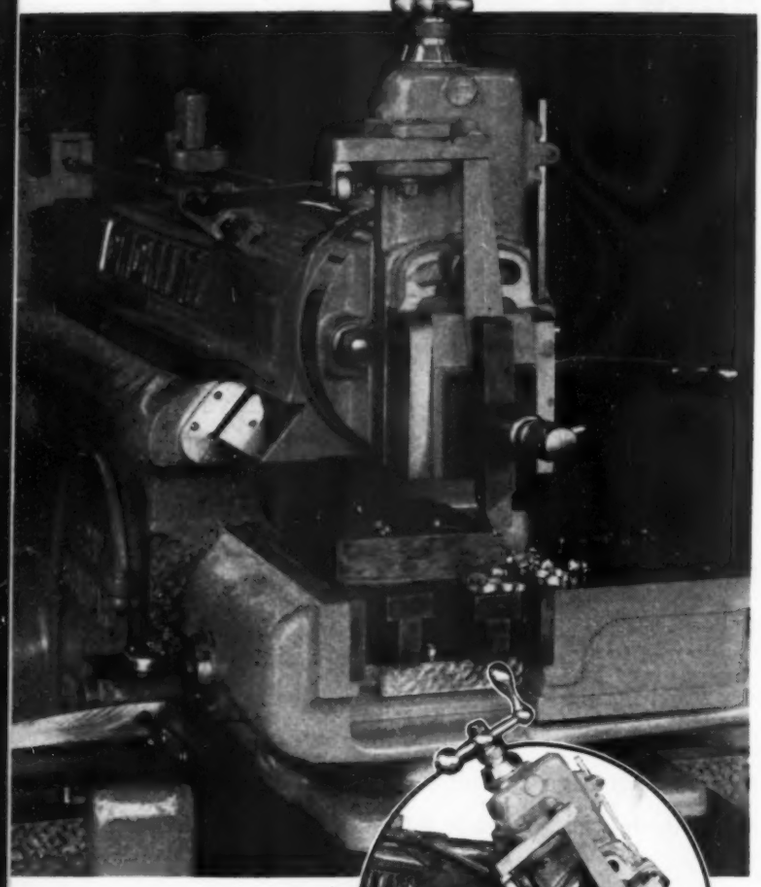
We suggest that you investigate the benefits of a wage incentive system if you do not have one at work now.

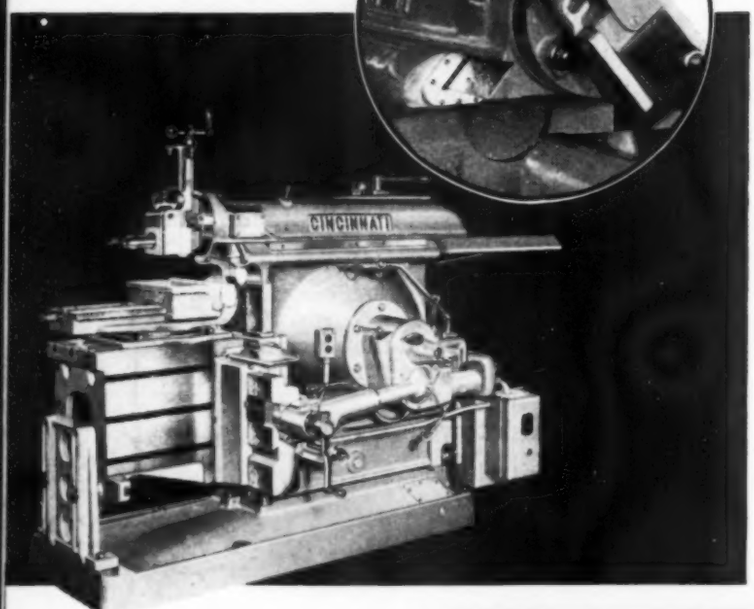
You are likely to find that such a system, properly installed and administered, will pay dividends—in cash to your employees and in a gain in productivity to you.

Burnham Finney

EDITOR

Millions of cuts . . .





with the NEW CINCINNATI TOOL LIFTER

DURABLE

The Cincinnati Tool Lifter, a new development, operates millions of times without a fault. A successful tool lifter must be certain in action on each stroke to prevent tool damage. It must *continue* to be certain month after month, year after year, for millions of operations. The Cincinnati Tool Lifter, with positive return as well as positive lift, is outstandingly successful.

VERSATILE

Efficient at high speeds or low, long strokes or short—dependable at different positions or angular settings of tool slide—or clapper box, the Cincinnati Tool Lifter is truly versatile and productive.

AUTOMATIC

It relieves operators and greatly increases speed of cutting. After simple setting it is automatic.

SPEEDY

Carbide and high-speed cutting tools both operate to greater advantage when protected by a Cincinnati Tool Lifter.
Write for Catalog N-3.

THE CINCINNATI SHAPER CO.

CINCINNATI 25, OHIO U.S.A.

SHAPERS · SHEARS · BRAKES

HOW HAMILTON HIRES

Visual discrimination is tested as applicant sorts watch parts in test given by Personnel Research Staff

The Hamilton Watch Co. was one of the first to begin experimenting with objective tests in selecting employees. Here's how 15 years' experience with testing has influenced its methods of selecting personnel

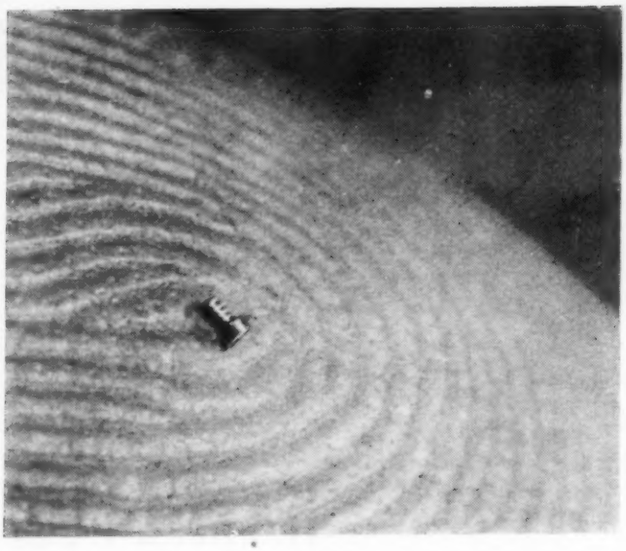
BY JOHN L. OWEN, Personnel Research Supervisor
HAMILTON WATCH CO.

LONG AGO it was learned that machines and materials in themselves will not produce the world's most accurate, portable measuring machine—a fine watch. Skilled craftsmen are essential — craftsmen who possess varied combinations of aptitude, intelligence, temperament, and interests. Today's mass-production methods, with their specialization, have made it even more important that the right person be selected for each job. No longer can the time and expense involved in the trial and weeding-out method be used for securing a skilled working force.

Matching men with jobs is quite different from forecasting the performance of machines and materials. With only a few exceptions, machines and materials can be held within controllable limits of operation, but the factor of personnel is subject to great variability. Through mechanical improvements, the productive capacity of a certain machine might be increased by 10% or more, but the employee who operates that equipment will determine if the additional efficiency is to be obtained, or if the machine will produce at only 50, 60, or 75% of its potential capacity.

The nature of most of the operations performed at Hamilton requires that an unusual amount of attention be directed to the human element involved. For many of the jobs within the Hamilton factory, an employee must undergo a four- to six-months' training period, and on a smaller number of assembly operations, the training periods which are established range from two to four years.

During this period of training, the new employee is paid the training rate, he is given capable and almost constant supervision, he occupies valuable work area, and he utilizes expensive, and in some instances, scarce equipment. On the other hand, during this period of training, the company receives only limited production from him, and must absorb the added loss in spoilage which is created through his inexperience. This situation makes it obvious that one of the Company's large



Tiny screws are made on this Hamilton screw machine. The piece which the operator is inspecting is shown on a fingertip at right, magnified ten times. It is 0.026 in. long and threaded 260 tpi. For such work, good visual and manual skills are essential

investments lies in the training of its employees, and that skilled personnel represent one of its greatest assets.

As early as 1933, Hamilton pioneered in the field of testing by constructing and administering tests to measure the finger dexterity of job applicants, and at the same time, conducted examinations for important visual skills. These earlier experiments opened the way for broader, more comprehensive studies with the human variable. Since the inception of testing, scores of both tailor-made tests and commercial tests have undergone experimentation, until today a complete and scientific program of personnel testing has been developed for our industry, and thousands of applicants have been tested.

Tests Are Not Exclusive

It should be emphasized that the testing procedures and methods utilized constitute only one aspect of the Company's integrated program of employment, indoctrination, and training. Psychological testing is used to supply valid information about an applicant which cannot be measured or determined by other conventional employment methods such as the interview, reference checks, and letters of recommendation. In this capacity, testing supplements the other employment procedures and does not serve as a replacement for them. Sound personnel selection depends upon the analytical appraisal of both test and non-test information.

The testing program at Hamilton is developed on an individual job basis wherever possible. Each specific job, or group of related jobs, is considered and studied individually in order to develop a battery of tests which will have the ability to predict behavior and job performance. To develop a battery of selection and placement tests, and to determine its value, for any specific job requires a procedure known as "validation."

The specific steps required for validation will depend, to some extent, upon the number of employees presently working on the job for which tests are sought, and the amount of time which can be secured from these employees for experimental work.

If the number of employees comprising a job is quite small, or if production schedules will be seriously retarded by their engaging in the experimental testing necessary, a validation procedure known as the "follow up" method can be used effectively. The follow-up method consists of administering the selected experimental tests to new employees at the time they are hired for the job in question, and later studying the results of the tests in the light of their subsequent job performance.

However, if the number of workers on a job is sufficiently large, and time permits their participation in the required experimental studies, the "present - employee" method of validation is generally found to bring results in a much shorter time. Because of the popular use of the present-employee method of validation, and because of the caution and skill necessary to apply it accurately, the steps required for its use are outlined in the next column.

Keystone visual test developed by Hamilton is given to an applicant. Careful examination is made of visual skills

Validation Steps

1. A complete analysis is made of each job, or group, of related jobs, for which selection tests are considered. The job analysis identifies and evaluates the relative importance of the various factors and elements which appear to be necessary to successful job performance.

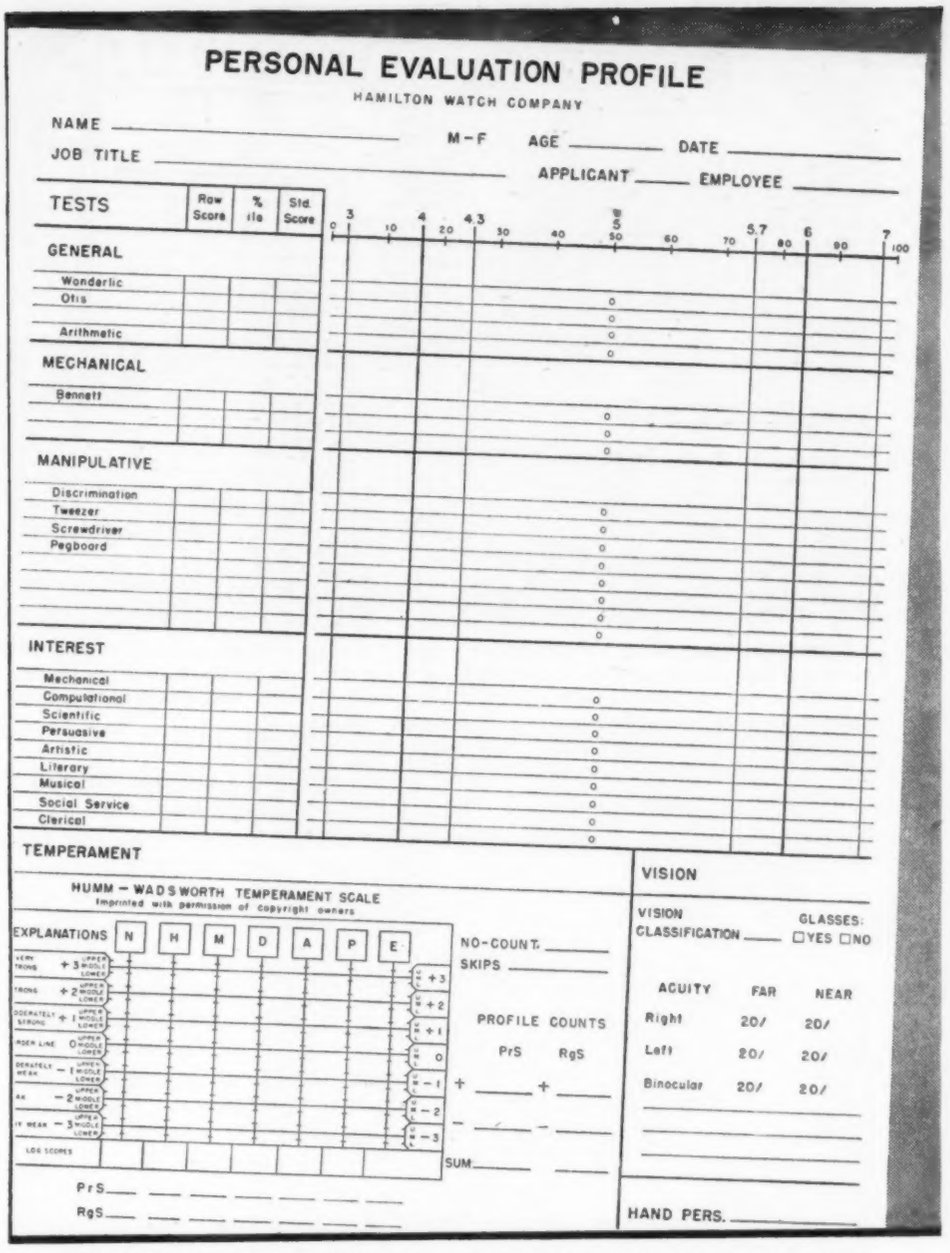
2. Tailor-made tests are developed, or available tests are selected, or both, which might logically measure some of those factors and elements of the job uncovered in the job analysis. The selection of these as yet unproven tests constitutes the experimental test battery.

3. The experimental test battery is administered under controlled conditions to either a selected number of employees presently working at the job or to the entire number of employees presently performing the operation, depending upon other circumstances in the study.

4. The scores made by the employees on each of the tests included within the experimental battery are studied and analyzed in relation to one of several valid indices of job performance. The trustworthiness of these indices of job performance (often referred to as the criteria) is highly essential, and for such reasons, immediate objective criteria are employed as much as possible to remove error and bias. Those tests which significantly differentiate between the superior workers on the job and the inefficient ones (or which present similar evidence of effectiveness) are retained from the experimental test battery and are combined to form the battery of valid or proven tests.

5. The battery of valid or proven tests is then used to select employees for that job for which it was developed. Those applicants who are considered desirable employees from a review of their non-test data, and whose test scores at the same time conform to the standards established from the studies conducted on present personnel, are selected for employment.

6. Systematized follow-up records are maintained and learning curves are plotted for each of the employees selected with the battery of proven tests. Objective records of this type permit an evalution of the battery in operation. If the battery of tests is found to be ineffectual for the selection of efficient personnel for the job on which it was validated, it may be necessary to reanalyze the operation and to attack the problem from an altogether different approach.


PERSONAL EVALUATION PROFILE

HAMILTON WATCH COMPANY

NAME _____ M-F AGE _____ DATE _____

JOB TITLE _____ APPLICANT ____ EMPLOYEE ____

TESTS | Raw Score | % ile | Std. Score

GENERAL: Wonderlic; Otis; Arithmetic

MECHANICAL: Bennett

MANIPULATIVE: Discrimination; Tweezer; Screwdriver; Pegboard

INTEREST: Mechanical; Computational; Scientific; Persuasive; Artistic; Literary; Musical; Social Service; Clerical

TEMPERAMENT

HUMM – WADSWORTH TEMPERAMENT SCALE

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EXPLANATIONS | N | H | M | D | A | P | E

NO-COUNT _____ SKIPS _____

PROFILE COUNTS PrS RgS

SUM _____

PrS _____

RgS _____

VISION

VISION CLASSIFICATION _____ GLASSES: ☐YES ☐NO

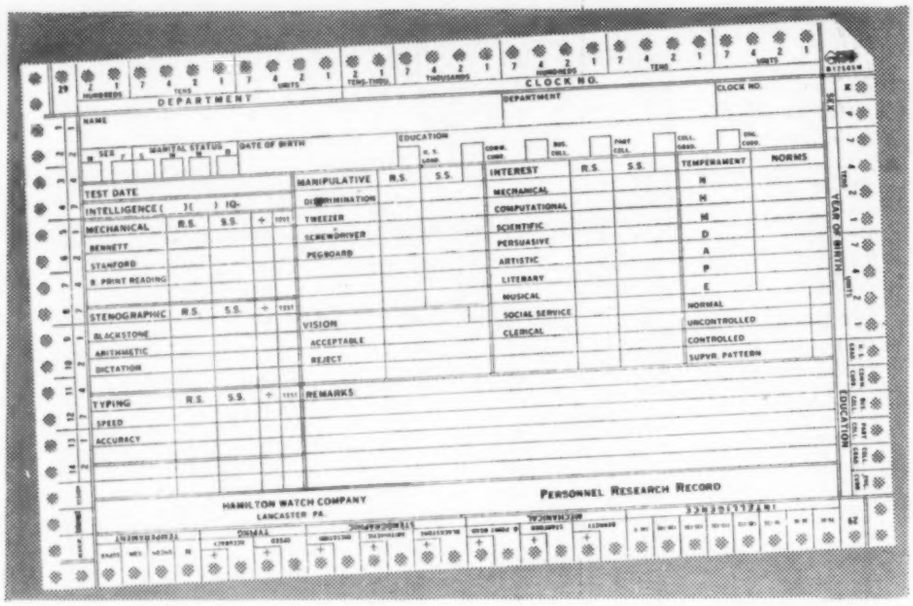
ACUITY	FAR	NEAR
Right	20/	20/
Left	20/	20/
Binocular	20/	20/

HAND PERS. _____

Personal Profile is an interpretative form upon which all test results for one applicant or employee are placed for evaluation

The development and validation of test batteries at Hamilton has not been limited to factory operations. The program has been extended to include test batteries for the selection of clerical workers and stenographers, as well as for the appraisal of supervisory candidates.

Repeated studies and careful observations have indicated the value of using a comprehensive test battery, meaning one that is developed to measure as many components of the human factor as can be reliably and practically accomplished with present psychological methods. In conducting psychological evaluations of both applicants and employees at Hamilton, four (and frequently five) areas of individual performance are investigated:



Personnel research record bears both personal data and psychological test results. Data are punched on the edges of the card and the cards can be sorted with the aid of slender rods (from which punched cards will drop) to produce desired cards in a few minutes

1. Intelligence
2. Skills and aptitudes
3. Vocational interests
4. Tempcrament
5. Physical fitness

The mental alertness of an applicant can be measured with several different types of intelligence tests, most of which are equally reliable if good test methodology is observed during the administration. A very important item, however, in the use of any form of reliable intelligence test is to know the most favorable ranges of intelligence required by the jobs for which the applicant is being considered. The most favorable intelligence ranges for a job can only be established by controlled studies upon an adequate number of present personnel of proven efficiency.

Skill tests for the measurement of achievements and the development of aptitude tests for the measurement of potential or hidden ability represent one of the largest industrial applications of tests. For the selection of factory workers at Hamilton, rather extensive use is made of manual aptitude tests to determine an applicant's finger agility and tweezer dexterity.

Interest scales and measurements of temperament are not as widely employed as tests for the measurement of performance in the first two areas mentioned, but they have been found to play an important role in conducting a comprehensive psychological evaluation for many jobs. A temperament measurement, containing adequate compensations for frankness and truthfulness, has been found especially valid for the selection of competent supervisors.

Tests for physical fitness are contingent upon the physical demands of various jobs. At Hamilton, stringent tests for visual skills are administered to examine an applicant's visual capacity to perform the operations existing in a watch factory. In addition, a test determines an applicant's tendency to create rust when handling small, steel watch parts.

The results of the various tests administered at the time of hiring are not limited in their use, however, to the selection and placement of new employees. For each individual employed, a permanent Personnel Record is prepared, on which are recorded all test results and certain personal and educational information. Not only are these data placed upon the face of the record, but they have been correspondingly punched in the edges of the employee's card. With the use of a hand tool, a large quantity of these cards can be sorted for a desired piece of information or for certain psychological characteristics in the matter of a few seconds.

Such a system facilitates a rapid analysis of Company personnel with regard to such factors as education, curriculum followed in high school and college, birth date, intelligence, typing proficiency, mechanical and scientific achievement, visual skills, manual aptitudes, fundamental temperament components, and many other related items. This technique has not only proven its practical value for the classification and tabulation of such data, but provides an excellent channel for "uncovering" potential supervisory material. Various types of skilled employees can also be "located" very quickly through this method when exigencies arising in production necessitate the services of additional personnel for a temporary period of time.

The complex nature of many of the operations, the long training periods with their proportionally increased costs, and the interval of time required before it can be determined if a new worker will develop into an efficient operator, have all created the necessity for developing the most effective methods possible to be used in the selection and placement of Hamilton personnel.

In evolving this program to select employees who will be occupationally stable and who will develop into efficient personnel, the use of validated tests has proven to be of definite value. Merely using tests does not in itself guarantee better selection, for their use must be guided by practical and logical reasoning, and their ability to predict behavior and performance must have been objectively substantiated. But experience at the Hamilton Watch Co. has indicated that certain testing procedures can definitely contribute to better selection if they are subjected to critical analysis, administered with caution, and their results interpreted in conjunction with the findings from other non-test employment methods.

DIESEL BEARINGS CAST IN SHEET-STEEL FLASKS

Split bearings for large diesel installations are formed by pouring bronze liners into flask rings around the steel shells. Accurate machining and close inspection insure good results

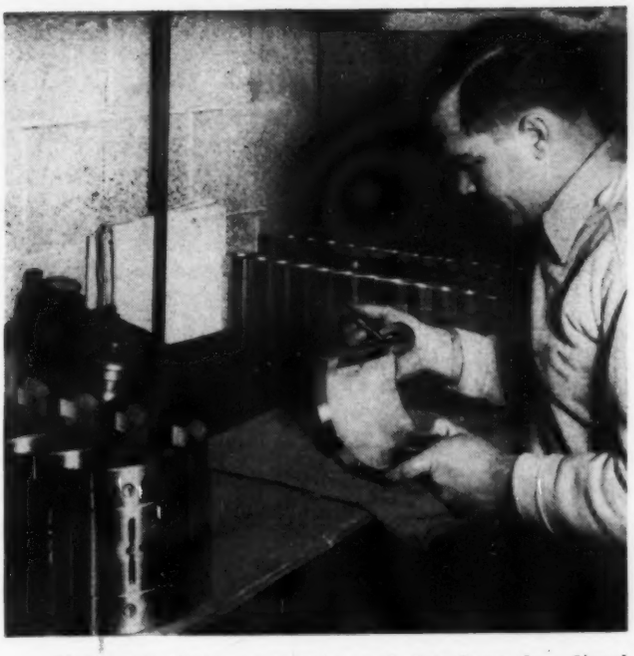
BY C. O. DONLEY,
General Motors Corporation Bearing Section Engineer, Allison Div.

SHEET-STEEL flask rings, press-drawn to the required shapes of the bronze liners, are a recent development in the manufacture of diesel-engine connecting-rod and main bearings.

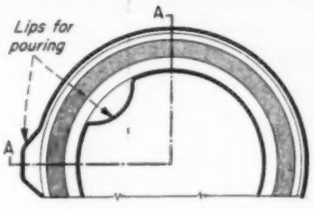
The steel shells are machined from SAE 1015 seamless tubing before the casting process begins. Outside diameters are ground to provide locating surfaces for later press-sizing. Bores of the shells are machined to surface finishes of from 80 to 160 microinches rms.

Flask rings are then welded, with suitable baseplates, to the shells. Flux is added and the assemblies are heated in a furnace. The bronze is poured and controlled cooling is provided by a special fixture.

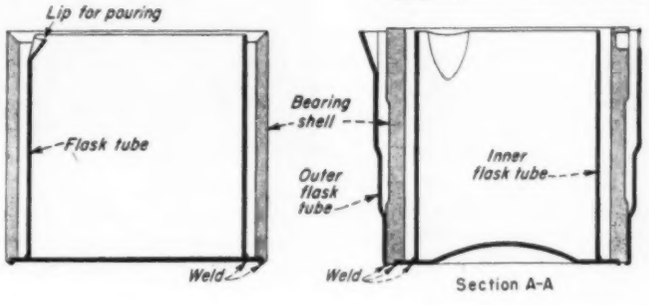
Machining is carried on, interspersed with inspection on a four-post gaging machine. External diameters are turned and ground in a battery of three machines, and the half sections are split apart. The bores are cut with a special spindle on an automatic boring machine using a carbide bit.



Bores of these connecting-rod bearings for diesel engines must be held to within a ±0.0005-in. tolerance



Drawn and welded steel flasks are fitted with the required steel shells and powdered flux is sifted into the cavities. A cover plate keeps the flux out of the inside hole. The double flask forms two bronze liners

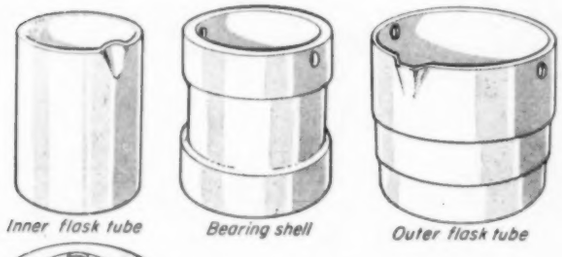


Single bronze lining inside steel shell is cast with one flask tube and baseplate. This liner is for a main bearing. With flux in place, flasks are heated in furnace before bronze is poured

Flask rings and baseplate for casting bronze liners inside and outside the steel shell are made from light-gage mild sheet steel. The parts must be concentric within 1/64 in. after assembly and welding

Heated bearing assembly is removed from furnace and is moved to pouring position under induction furnace that heats bronze. The molten metal displaces the flux to prevent oxidation of the steel surface

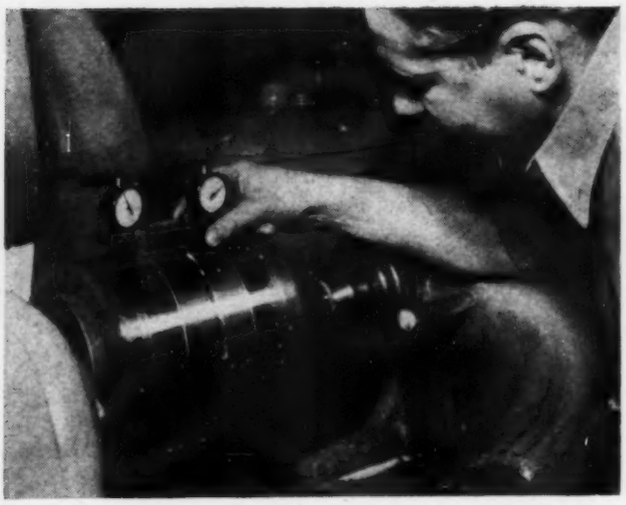
Automatic quenching machine rotates casting on table which slowly lowers into tank. Water streams directed radially against cast part control cooling. Rough machining follows, and the bearings are cut in half



Connecting-rod-bearing flask is built up from the bearing shell, two machined tubes and a base

Hydraulic 300-ton coining press sizes steel-backed connecting-rod top halves and main-bearing bottom halves before final machining. Punch block contacts only on split faces. Air cylinder (foreground) ejects parts

Special gaging machine checks height and alignment of split bearing faces after several stages of machining. Each face must parallel the centerline of the fixture. In final inspection the O.D. must be in continuous contact with the bore of the fixture under a specified load



Two dial indicators in height gage check step between exposed steel shell and bronze liner of connecting-rod bearing. Tolerance for this height is 0.0004 in. All outside surfaces are finished at this point

Finish boring is done on precision single-spindle Borematic. Heavy spindle extension carries carbide-tipped bit in heavy holder that prevents chatter during the interrupted cutting. Spindle is held in position by temperature control for lubricating oil when machine warms up

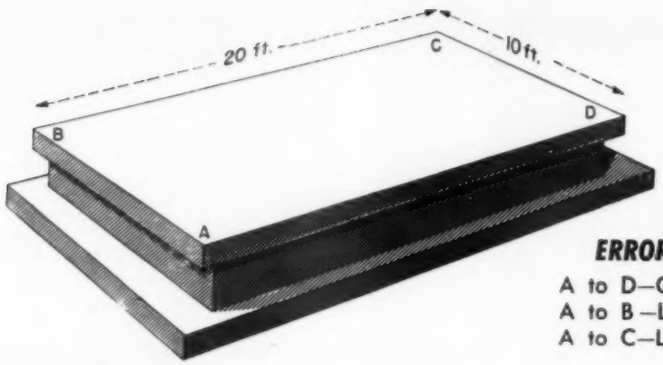
SHEAR FACTS

IT COMES as somewhat of a surprise to learn that until 1912 tailors' shears were all made of malleable iron with welded crucible-steel blades. In that year, Wiss introduced the first drop-forged steel shears with welded high-carbon cutlery-steel cutting edges. Drop-forged steel scissors, without the welded edges, were also brought out at that time and virtually drove from the market the inferior grade cast-iron and cold-stamped scissors which broke easily and would not hold an edge.

More than 70 different types of snips, scissors and shears are now available, ranging from babies' nail scissors to BX cable cutters, and including such odd items as special clippers for harvesting lemons, and right-angled shears for the wealthy investor to clip coupons.

"Shears" are generally 6 in. or more long, and have one small handle for the thumb and the other large enough for two or more fingers. The variety smaller than 6 in. is usually catalogued as "scissors" and has two matching handles.

In a new book, "A Story of Shears and Scissors," published by J. Wiss & Sons Co., Newark, N. J. to mark its 100th anniversary, the development of shears is traced from the fifth century B.C. Even today, manufacture is largely a manual job, involving as many as 176 separate operations.



ERRORS IN SURFACE PLATE
A to D—Out of level 0.140″
A to B—Low 0.006″ at center
A to C—Low 0.025 at C

How Would You Recondition a 10x20 Ft. Surface Plate?

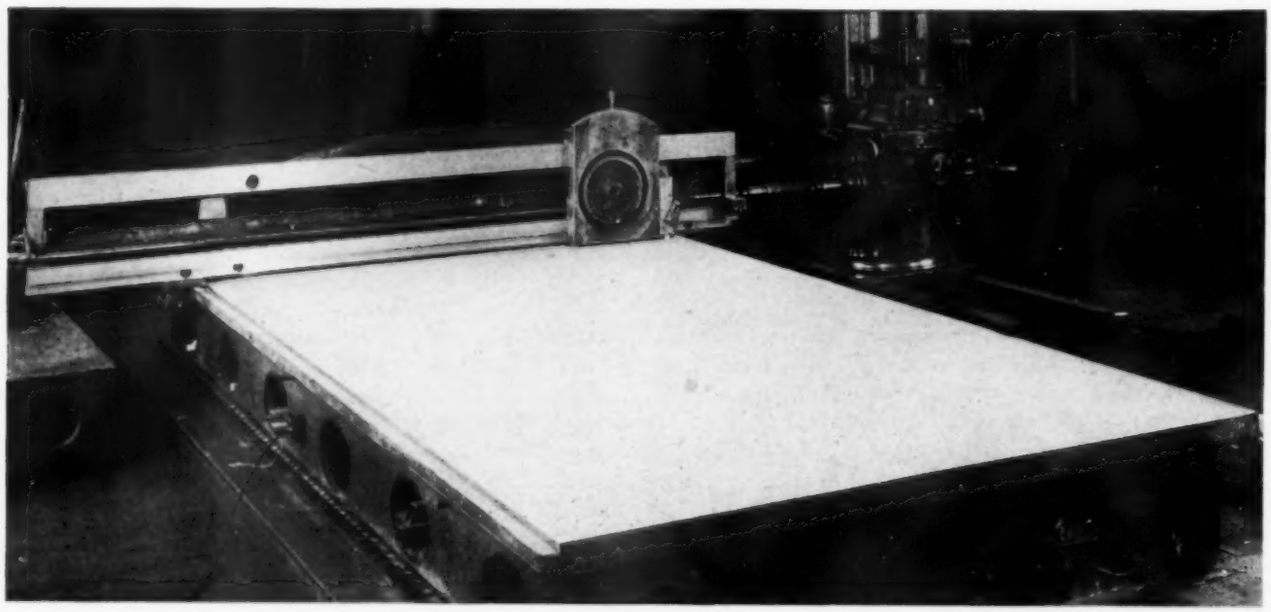
Here is a method that produced a surface that was planed within 0.0003 in. and the job was finished next morning

BY RUPERT LE GRAND, ASSOCIATE EDITOR

A SMALL SURFACE plate can be rescraped, but reconditioning a warped one measuring 10x20 ft. is a job that many capable mechanics would hesitate to tackle. But a job of this kind was recently performed without trouble at the Naval Gun Factory, Washington.

Examination of the huge plate (used to inspect gun-mount fixtures) revealed an excessive degree of bowing and twisting after many years' use. Quarterman Machinist Luther E. Lee undertook to restore the surface plate to first-class condition. Obviously, it was impractical to rescrape the plate or to remove it from its foundations for planing. A portable-machine setup was necessary. Here is the step-by-step procedure devised by Mr. Lee.

1. To establish reference surfaces for machining a plane surface, two guide rails were accurately planed and then fastened to opposite sides of the surface plate. Before attach-



Cuts across the surface plate were taken by a tool in the clapper box mounted on the side of the planer-rail saddle. Power for the cutting stroke and automatic return was supplied by the Giddings & Lewis portable boring machine

ment, the rails were leveled to 0.0002 in., using a B&S 12-ft. camelback straightedge and a Pratt & Whitney level.

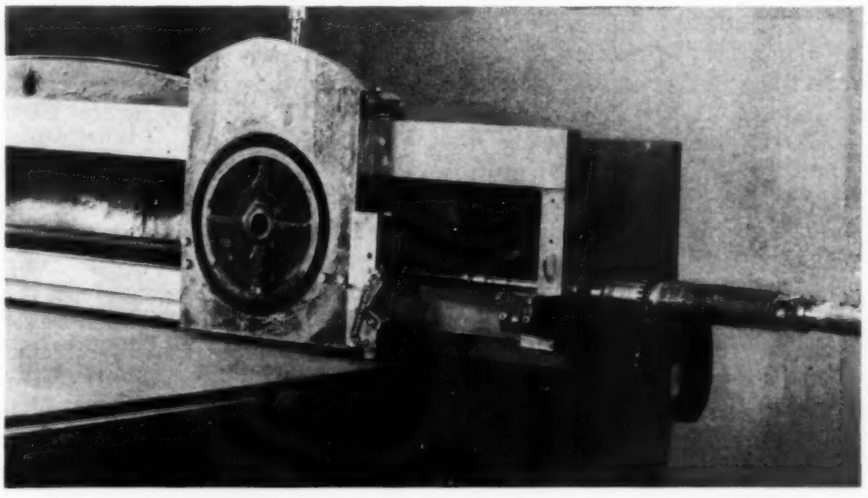
2. The rail was removed from an idle planer and machined straight all over. One saddle was left on the rail, and a toggle-operated clapper box was doweled to one side. Thus, when the saddle was traversed along the feedscrew, a tool held in the clapper box would take a cut parallel with the rail.

3. Two angle brackets were fastened on the rear of the planer rail and bearing strips were applied to the bottoms of the brackets. Now, the rail could be placed in position to straddle the surface plate, with the bearing strips resting on the two guide rails, or reference surfaces. Clearances above the original surface of the plate were: between brackets and plate —approximately 1/16; between rail and plate—about 2 in.

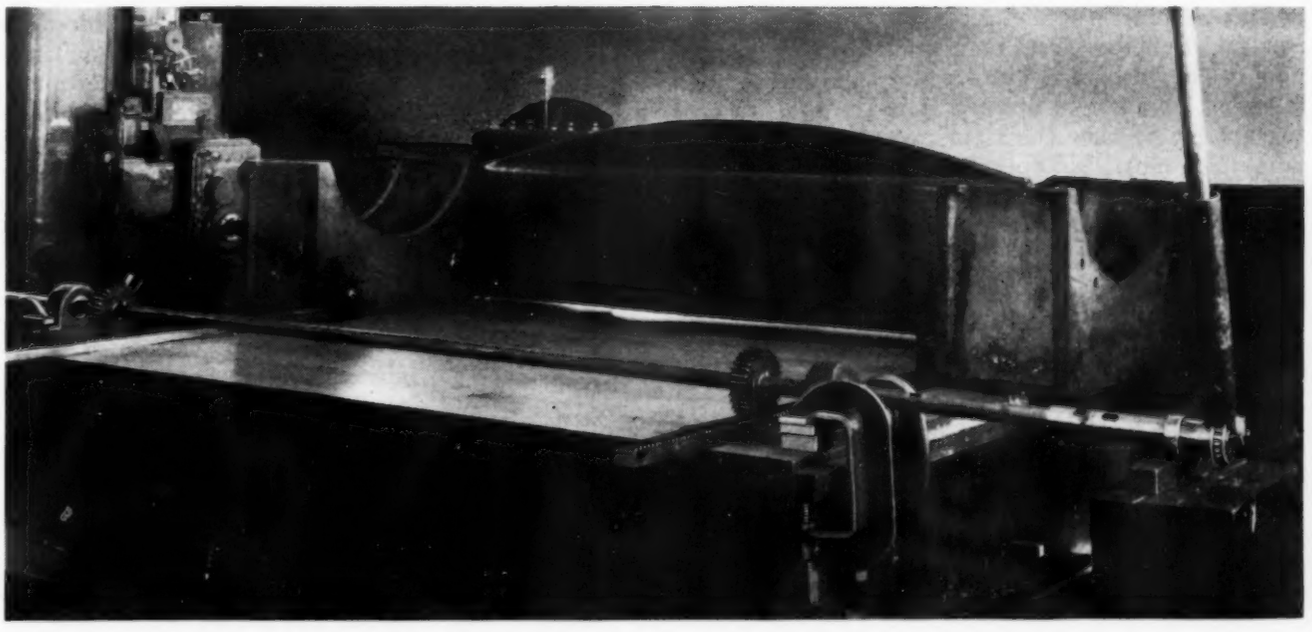
4. Power for the cutting stroke and return was obtained by setting a portable Giddings & Lewis boring machine adjacent to the surface plate and coupling the planer-rail feedscrew and the machine spindle with a universal joint connection. By use of the machine's tapping-reverse mechanism, it was possible to reciprocate the saddle without attention at 15 ft. per min. This feature was responsible for saving a great deal of time.

5. Traverse was obtained by moving the planer-rail and bracket assembly on the guide rails by means of a rack and gear arrangement. The planer rail was moved back over the original surface of the plate, so that there would be no chance of picking up chips and marring the freshly machined surface. To obtain the desired motion, a rack was fastened to each of the brackets. Connection was made by a dowel and elongated hole that permitted vertical movement at the joint. To reduce friction, the racks were separated from the table by brass sheet. To pull back the racks, a cross-shaft with two drive pinions was mounted in pillow blocks clamped to opposite sides of the surface plate. Each setting of the racks allowed 50 in. of the table length to be planed.

Four cuts were taken. The roughing cut was taken with a round-nosed tool and 3/16 in. depth of cut. Three finishing cuts were taken with a broad-nosed tool taking a cut about 1 in. wide: the first removed tool marks; the second removed about 0.025 in., and the third about 0.001 in. When finished, the surface plate was found to be flat within 0.0003 in. and the cuts at the several steps blended. The job was started in the afternoon and was finished by the next morning.



Toggle mechanism lifted tool on the return stroke



By use of the ratchet, the planer rail was racked backward before the saddle-mounted tool began its next cut

COST-CUTTING MILLING SETUPS

Five extra minutes to insure proper setup can sometimes save weeks of production time

BY ALLAN F. CLARK

Time Standards Engineer
Pitney-Bowes, Inc.

MILL A SLOT ½ in. deep, by ½ in. wide, by 2 in. long, at a 1 in. table feed, and it will require over 3 min. of cutting time. Mill the same slot at a 5-in. feed and the time is reduced to slightly more than half a minute. Strangely enough, savings here have been effected not only in time, but also in tooling costs.

With the current high price of labor, management is becoming increasingly cost-conscious of shop operations. Plant-wide work simplification programs—along with Time-Study analyses—are proving valuable factors in stepping up production and cutting operating expense. In view of such growing concentration on cost reduction, and in the face of a rapidly developing competitive market, it is not enough to have the right machine; it must be operating at maximum efficiency, with most practical feeds and speeds.

Too often the reverse is true. A company spends several thousand dollars for a machine that will turn work out faster. During its initial introduction, representatives of the manufacturer do an honest job of demonstrating the machine's ability, and for a while its performance is excellent. But as the work changes it is necessary to reset the machine for other parts. For this the setup man consults his instruction book. This is complete in care and operation of the machine but often lacking in the production element.

The type of material, character of cut, chip load, number of teeth in the cutter—factors that have direct bearing on correct feeds and speeds too often are never considered. Not that such data are unavailable—machine manufacturers have gone to unlimited expense to publish and distribute various results of laboratory cutting tests, and accompanying recommendations. Unfortunately, these data generally miss the mark, find their way to the shop superintendent's drawer marked "Machinery File" where, for the most part, they remain static.

Those operations that are, as a consequence, set up by the old "rule-of-thumb" method are the costliest—high speeds scoring the cutting edges; low feeds causing expensive delay in production. Where records are kept, original setups become permanent errors for succeeding operations that may run for years.

An outline of important "setting factors" should include (a) classification of work material being used; (b) character and dimensions of cut; (c) horsepower requirements; (d) appropriate machine; (e) type, size, angle, and number of teeth of the cutter; (f) location of cutter on the arbor; (g) proper coolant; and (h) correct feed and speed. Modern incentive plans require a check by Time Study on elements such as these before a permanent standard is applied.

Although the selection of proper milling feeds and speeds is dependent to a great degree upon rigidity of the holding device, tolerances, and finish required, a fair approximation of the correct setting can be established before setup by use of these "setting factors." This procedure is necessary in order to figure pre-production cost estimates. It is also advantageous to the machine setter, providing him with the most practical feed and speed range, inside of which he can obtain maximum tool life. Determination of the range is accomplished by simple calculation in two steps: 1st, speed; 2nd, feed.

Each metal has its own relative degree of machinability. This is reflected in sfpm. (surface feet per minute) according to the type of work material used. The sfpm., in conjunction with the cutter diameter, actually is the determining factor in establishing the appropriate rpm., at which the part should be cut. Actually, the formula used is :

$$\text{sfpm.} \div \frac{D \pi}{12} = \text{rpm.}$$

But for all practial purposes (since the exact rpm. calculated is not always available on the particular machine) a much shorter formula will serve equally as well:

$$\frac{4 \times \text{sfpm.}}{\text{Cutter Dia.}} = \text{rpm.}$$

The 4 remains constant. The following examples show the spindle speed calculated with each formula, for comparison:

A rough cut is desired in a piece of work material such as SAE 1020, 70 sfpm., using a 3-in. plain milling cutter. Using the long formula, the diameter of the cutter (3 in.) is multiplied by π (3.1416); the product (9.4248) being in inches is then divided by 12 to obtain feet (0.7854); which, in turn, is divided into the sfpm. (70) with a result of 89.1 rpm. Using the short formula, the sfpm. (70) is multiplied by the constant 4, with a result of 280, which is divided by the diameter of the cutter (3) to obtain 93 rpm. As the speed selection of the machine may run in steps, such as 75, 90, 110, either choice would be to select 90 rpm. for the cut.

Correct spindle speed is important in preserving the life of the tool. Except for complete breakage, nothing is more detrimental to cutting edges than a speed set too high. The effect is much like that of a tire spinning rapidly in a rut; excessive heat is generated faster than it can be carried off and, in the case of the cutter, results in burned, scored cutting edges. It is impossible to estimate how much re-tooling is made necessary in many shops today because of this one factor alone. Too many teeth in the cutter will have relatively the same effect, and for this reason most research laboratories advocate limiting the number of cutting teeth to a minimum.

Both the spindle speed and the number of teeth in the cutter play an important part in determining what the table feed will be. Feed-per-tooth-per-revolution, or ftr., is the distance (in inches) the feed table is set to advance for each tooth in each revolution of the cutter. This is commonly called "chip load," and generally is regarded as the amount of material removed by each tooth as it passes through the work. By multiplying the feed-per-tooth-per-revolution by the number of teeth in the cutter the table feed for each revolution of the cutter is obtained (in inches). And by multiplying the feed per revolution, by the number of revolutions per minute, the table feed in inches per minute is determined. The short formula for feed, then, is: ftr. $\times$ No. Teeth $\times$ rpm. $=$ Feed (ipm.).

Table I MILLING RANGE
Surface Feet Per Minute

MATERIAL	HIGH-SPEED STEEL CUTTERS, sfpm.
Aluminum	300 to 500
Brass	150 to 300
Soft cast iron	60 to 80
Hard cast iron	40 to 60
SAE 1112 SAE 1315	60 to 110
SAE 1010 SAE 1020	50 to 90
SAE 1045 SAE 6150	40 to 70

The most expensive milling setup is that in which the feed is set *too low*. This cannot be over-emphasized, for while this also causes undue wear on the cutter, the greatest loss is in costly production time. This can be most effectively illustrated in the following examples:

A machine setter in Plant A sets up a semi-automatic milling operation to cut a slot in a piece of work material listed as SAE 1112, 90 sfpm. The slot is 0.375 in. wide; 0.250 in. deep; 1.5 in. long; and the cutter selected is a 3-in. high-speed-steel plain mill with 28 teeth. Plant A has neglected to effect cost reduction with planned training programs, and the machine setter goes about his task of setting up the job as he has dozens of others. The last job that ran on the machine used 350 rpm., and since no fault was found by Inspection with the finish produced he decides to use the same setting. He remembers a similar cut that took a 3-in. feed, and sets the gears accordingly.

A few pieces are machined, minor adjustments made for tolerances, and a sample is passed on to Inspection for approval. The job is then processed by a production operator. Since the cut is 1.5 in. in length, 0.8 inches must be added for approach and overtravel allowances, making a total length of cut of 2.3 inches. At a table feed of 3 ipm., therefore, the cutting

Table II . . . MILLING RANGE, FEED PER TOOTH PER REVOLUTION

	SLAB CUTTER IN.	FORM CUTTER IN.	SAW IN.	FACE CUTTER IN.	SLOT, SIDE CUTTER IN.	END MILL IN.
STEEL						
SAE 1045 SAE 6150	0.004 to 0.006	0.001 to 0.002	0.001	0.006 to 0.008	0.004 to 0.005	0.002 to 0.003
SAE 1010 SAE 1020	0.006 to 0.007	0.002 to 0.003	0.015	0.009 to 0.010	0.006 to 0.007	0.003 to 0.004
SAE 1112 SAE 1315	0.008 to 0.009	0.003 to 0.004	0.002	0.010 to 0.012	0.007 to 0.009	0.004 to 0.006
CAST IRON						
Hard	0.009	0.004	0.001	0.006	0.008	0.004
Soft	0.012	0.005	0.003	0.014	0.010	0.009
ALUMINUM AND BRASS						
Minimum	0.009	0.004	0.001	0.007	0.006	0.004
Maximum	0.015	0.006	0.004	0.015	0.012	0.010

time amounts to 0.76 min., or 46 sec. Allowing 14 more seconds to load and unload the part in a vise, the production of a normal operator would be 60 pieces completed per hour.

The Better Way

Plant B has trained its machine setters to respect the value of correct feeds and speeds. Recommendations of research laboratories and tool manufacturers concerning proper use of surface feet and chip load charts have been adopted, and are carefully considered before each initial setup. The same part is ordered from Plant B, and the machine setter selects his tools. After checking the rigidity of the holding device, he picks a stagger tooth cutter with 18 teeth. He knows the staggering will provide more space for chips, while fewer teeth will mean less heat and wear. He locks the cutter on a shortened arbor with a key, locating it as near as the cut will permit to the spindle nose, or supporting arm, to lessen vibration.

After adjustments for dimension, the setter refers to his surface feet chart in order to determine the spindle speed. He finds SAE 1112 listed at 90 sfpm. and, using the short speed formula, multiples this by 4 and divides by 3—the cutter diameter—to get 120 rpm. Next he consults his ftr., or chip-load, chart to determine the feed to be used. He finds a chip-load range for this type of cut to be 0.007 to 0.009, and decides to use the minimum first, as usual, and work up to the maximum. For this he uses the short feed formula, multiplying the number of teeth (18), by the ftr. (0.007), by the rpm. (120), to get 15.1 ipm. feed. The next lowest feed selection on the machine is 14 in., at which he sets the gears.

After cutting a few pieces, however, the feed is advanced to 16 in., at which point the setter feels a maximum has been reached. As in Plant A, the total cut is 2.3 in., which when divided by 16 ipm. table feed shows a cutting time of 0.14 min., or about 9 sec. Using the same loading and unloading time as in Plant A 14 seconds, the production of a normal operator would be 156 pieces completed per hour.

Comparing operations, we find that the setup in Plant A used an exorbitantly high spindle speed—about 300% higher than it should have been—definitely shortening tool life by overheating and scoring. This is reflected in the ridiculously low ftr., or chip load, which should have been at least 20 times higher. Plant B cut the part in one fifth the time of Plant A, and produced 160% *more* pieces per hour. On a shop order of 12,000 pieces this means 123 man hours saved, or the equivalent of a normal operator working three 40-hour weeks. All because a trained machine setter spent five more minutes setting the job up right!

Fit Fixture to Job

It is true that correct feeds and speeds are dependent to a great degree upon the rigidity and strength of the fixture. Perhaps more practical reasoning would be that the rigidity and strength of the fixture should be dependent upon the necessary degree of feed and speed required in machining. For this a gage is needed, which can only be on the basis of determining what the *correct* feed and speed range should be. Any holding device so insecure as to limit productivity should be redesigned or strengthened to meet these standards.

The specified surface feet per minute of work material reflects, in general, the approximate degree of machinability. This relationship varies, however, with more or less difficult machining operations, such as rough and finish cuts, light and heavy tools, etc. For this reason in Table I, a representative *range* has been provided for various metal grades. Rough cuts, for example, should be figured at the range minimum, with a consequent lower rpm. and feed. Light, or finish, cuts should reach porportionately nearer maximum.

In like manner, Table II provides a recommended chip-load range in relation to the type of work material, and the amount of material to be removed. Figures represented have been developed in actual shop practice and, in general, may be considered most practical under normal conditions.

It is important to coordinate the feed and speed as nearly as possible. To do this the speed is determined first, with relation to surface feet and cutter dimension; then as a follow up, using the speed, cutting teeth, and chip load, the feed is determined. Starting with a conservative minimum the speed and feed are advanced progressively on the machine until a maximum within the range has been reached.

Only by use and improvement of recognized measurement standards of this type can we hope to achieve maximum machine performance and tool preservation. The application of proper machining feeds and speeds can only be effected by properly supervised job training, without which no cost reduction program is complete.

Tips FOR TOP SHOP MEN

260 The dollar sign is still the poorest gage of a man's worth. The ownership of money or goods brings neither ultimate success nor happiness—and shouldn't necessarily command respect. Base your opinions on what a man *is*, not on what he's got.

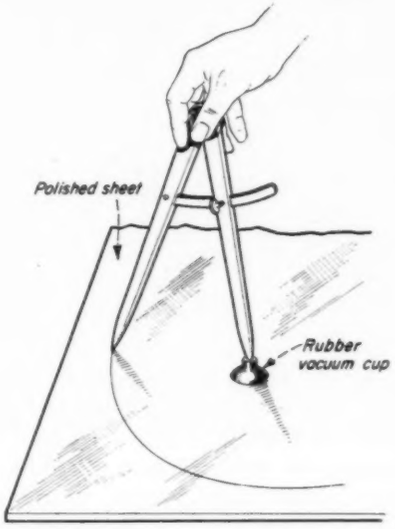
261 It's important to know who checks tools out, and just as important to know who brings them in. Checking tools out is only half the job—because their condition on return affects their reuseability.

262 The time has passed when brawn was cheap. It's cheaper now to buy brains—and let machines do the work. One smart truck operator can out-work an old-fashioned labor gang—and get less tired doing it.

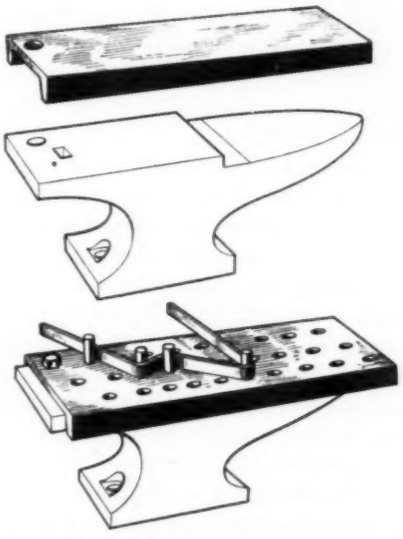
263 Despite sickness insurance and allowances, there's still one illness that can cost a man his job—when the boss gets sick of the sight of him. Watch for the symptoms in yourself.

Short Cuts FOR THE SMALL SHOP

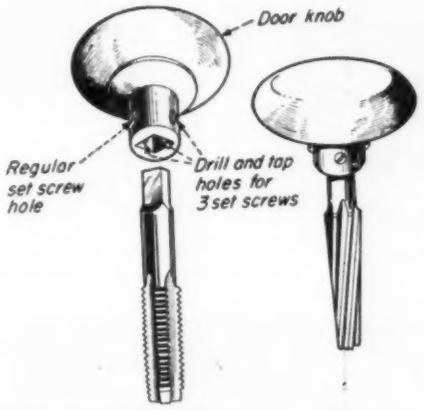
BY A. H. WAYCHOFF



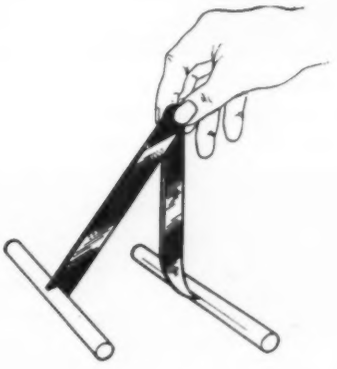
CENTER PUNCH MARKS on polished material can be avoided, when scribing circles, by setting one leg of the dividers in a small vacuum cup, as supplied with arrows for indoor archery sets. The cup will prevent the dividers from slipping.



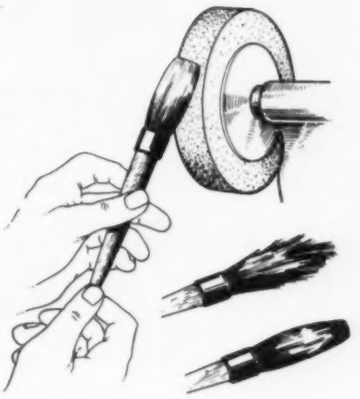
AN ANVIL JIG will be found useful to bend small flats, rod and pipe to complicated shapes. To make the jig, secure a piece of channel iron that will fit over the anvil snugly. Drill one hole for a bolt to secure the channel to the anvil, drill a number of other holes in a zig-zag pattern to receive pins for bending purposes. Some of these pins may be threaded on one end to receive a nut. Thus, when the threaded pins are inserted from the back of the channel, they will not pull out. The balance of the pins should be a slip fit, and are put into desired holes and taken out as the work of bending progresses.



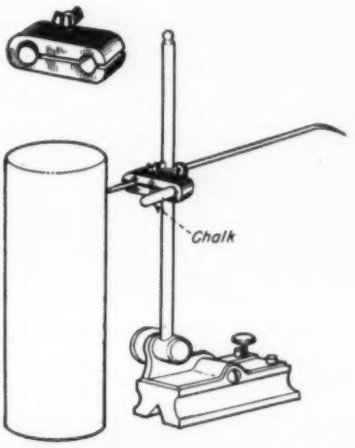
OLD DOOR KNOBS make good tap and reamer wrenches. Drill and tap the shank to add three setscrews to the one already there. These four screws will hold the tool securely by the square end. Advantage of the door knob is this: it can be used in tight or awkward places where the usual tap wrench would be useless.



PARALLELISM of shafts or bars can be established with a pair of calipers made this way: Take a pair of old hacksaw blades. Grind a V-notch in the end of one and a sharp point on the end of the other. Assemble the blades. With the V-notch of the caliper riding one shaft and the pointed end just touching the other shaft, any deviation from parallelism will be detected by sliding the device.



PAINT BRUSHES soon become shaggy and out of shape from touching up work after welding and from standing in a paint can. To make them useful again, dip them in glue, smooth out the bristles and allow to dry. Then reshape the brush on a grinding wheel and soak out the glue.

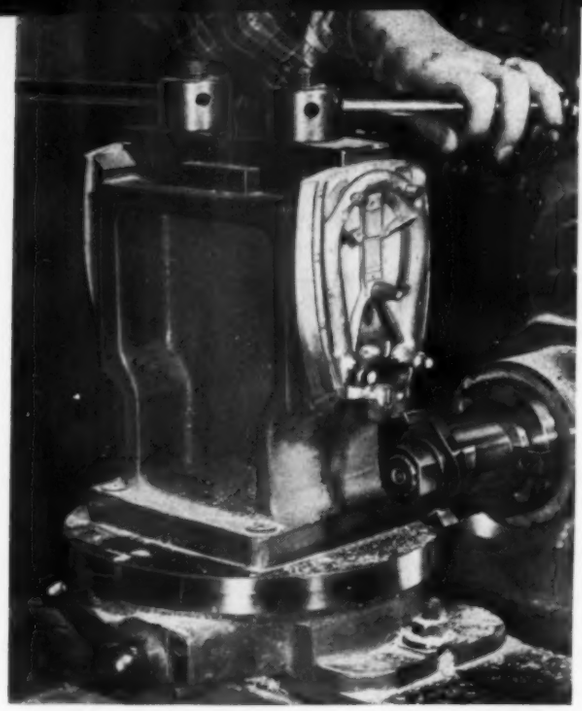


A CHALK HOLDER for the surface gage allows one to chalk the work and scribe in one operation. To make the holder get a block of brass or aluminum, bandsaw to the shape shown. Drill two holes: one for the scriber and the other for the chalk. Make a saw slot from one side to the second hole, so that the holder can be clamped to the scriber. Apply a screw and wingnut. With the holder in place on the surface gage, and the scriber set to the correct height, it is a simple matter to scribe a line around the work as shown by turning the piece. The scribed line will stand out against the chalk background, thus saving the eyes and cutting chances of a mistake.

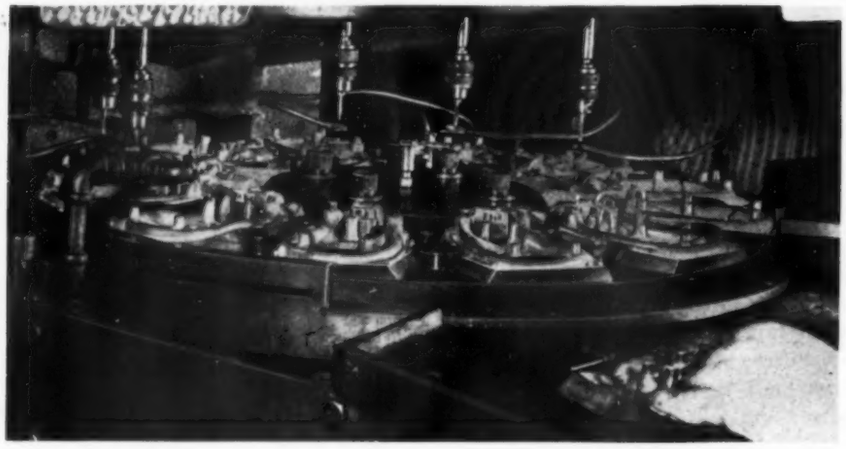
PRECISE PROCESSING

Die cast aluminum shoes with cast-in heating elements and ingenious tooling combine to speed production of domestic flatirons

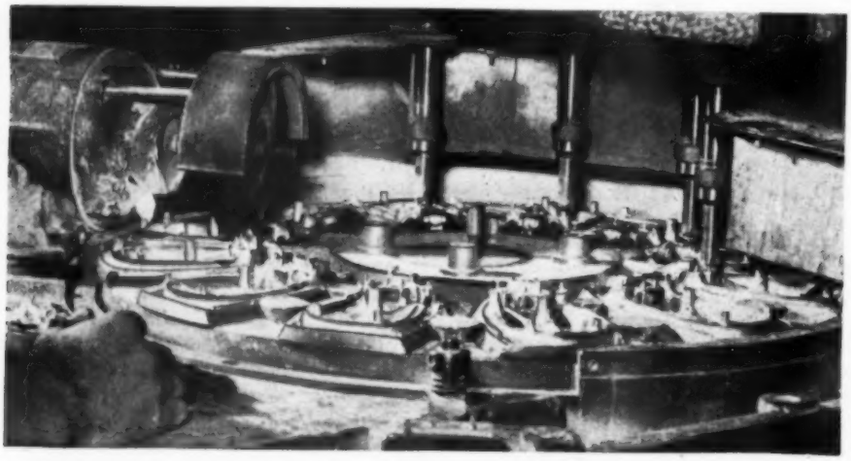
BY LEO J. PANTAS, Manager, Buffalo Plant, YALE & TOWNE MFG. CO.



Two-position index fixture is used for milling between the ears of a die-cast aluminum shoe for an electric iron. Mating toe-piece hinge is straddle-milled on a similar fixture in another machine



Inverted-cone clamps are used to position and hold iron shoes for tapping five holes on a special rotary fixture. Loops made from pipe cleaners feed lubricant to taps and prevent flooding with oil



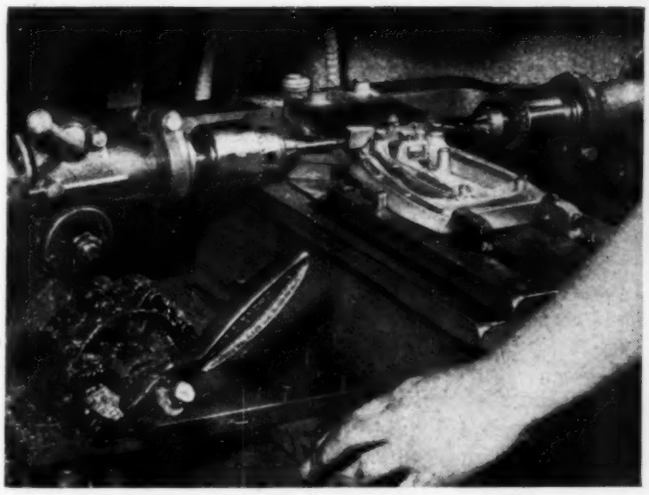
Hollow mills remove steel sheathing and insulation from cast-in heating element terminals, and oscillating wire brush removes burrs and polishes the ends in preparation for assembly of the bus bars

HIGHLY mechanized for maximum efficiency, the new Yale & Towne electric appliance plant in Buffalo, N. Y., furnishes an interesting example of careful production planning in the setup of its domestic electric-iron line.

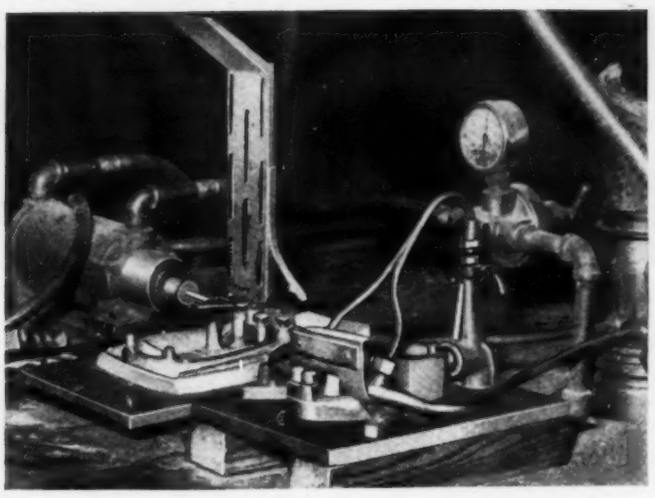
The shoe and toe which make up the sole-plate of the Tip-Toe iron are aluminum die castings to reduce the amount of machining required. Dimensions are held close to finished size and smooth castings are obtained. The rod-type heating elements are fabricated in the plant and delivered to a vendor's foundry where they are cast into the sole-plates as inserts. This procedure insures positive location of the heater elements for optimum heat distribution in the finished iron, and facilitates some of the machining operations. Each element has two terminals located coaxially with a tubular steel sheath, but separated from it by an insulating ring of closely packed magnesium oxide which also acts as a good heat conductor.

As the shoe and toe castings must be assembled at a hinge, involving close fitting parts, processing of the two parts is similar and is done along parallel lines. Work stations are joined by sections of roller conveyor along which parts advance in tote boxes or on pallets. This not only makes for rapid handling at convenient height, but provides moderate banks between stations so successive operations do not have to be performed at precisely the same rates. In general, how-

PRODUCES FLATIRONS FASTER



Hinge-pin hole is drilled and reamed through both shoe and toe pieces simultaneously to insure accurate alignment. Toe piece is later re-reamed for a free fit on the pin



Compressed-air fixture (right) sprays graphite lubricant into toe-hinge hole. Part is transferred to fixture (left) where hinge pin is inserted in both parts by air ram

ever, operations are about the same length or, where longer than normal, are performed at duplicate stations which, together, keep step with shorter operation stations.

At the initial stations on both lines any sharp edges on castings are removed by grinding, and edges and some end surfaces are wheel polished offhand. The excess length of heater elements, provided initially to facilitate holding in the casting die, is then sheared off in a press. The only other machining on the castings is at the hinge, and the polishing and buffing of the sides and the flat bottom surfaces that perform the ironing operations. No plating is needed, as the parts take a high polish that is retained for long periods and, in service, undergo self-polishing.

Mating surfaces of the integrally cast hinge projections are milled on machines equipped with special double-ended fixtures which swing quickly 180° by hand and lock automatically in correct indexed position. The fixture has quick-acting clamps so the operator can unload and reload the idle end while the automatic feed advances the work on the opposite end into the cutter. Cycle time is 10 sec.

A cutter with two carbide tips mills the inner surfaces between the two ears of the shoe. For the toe casting, which has a single projection to fit between the ears of the shoes, the setup is similar, except that the projection is straddle milled on the outside faces to make a clearance fit.

Air Fixtures Used

At the end of the two lines, both conveyors deliver parts to a station where a pair of castings is placed in a fixture which holds both parts in correct relative position while the hinge pin hole is drilled and reamed. Air clamping is used, and drilling and reaming is performed by a double-end drill-press set horizontally and fed by hand. The hole passes through both ears of the shoe and the projection on the toe. A shim is applied to take up the clearance.

The castings, still in pairs, then move to the next station where the toe piece is re-reamed, using a head and chuck driven by an air motor. This provides a running fit on the hinge pin in the toe piece. Flocculated dag (graphite compound) suspended in acetone is sprayed into the holes with an air gun to provide lubrication, even when, in service, the parts are hot. The toe is set into a fixture with its hole in line with the holes in the shoe ears, and an air ram inserts a hinge pin from a magazine.

After this operation, the assemblies, on pallets, are passed along the conveyor to a five-spindle, automatic tapping machine equipped with a multi-place dial fixture. The table indexes every 30°, and the five taps operate simultaneously. Production is at the rate of 300 pieces an hour. Assemblies are held and precisely spaced by inverted steel cones which fit the beveled edges of the castings. Each tap is kept lubricated with a tapping compound fed through tubes under light pressure. At the end of each tube is a plug having two holes into which are inserted the ends of a loop made from a smoker's pipe cleaner. These loops, acting as wick feeds, are set to touch the taps as they feed down and apply the lubricant in small amounts without dripping.

A similar fixture is also used on a four-spindle machine which has carbide-tipped end mills to cut away the sheath surrounding the terminals at the projecting ends of the two heating elements. One tool operates at each of four indexed positions, baring the terminals

Flock-covered pallets protect highly polished shoe surfaces during assembly operations on a continuous belt conveyor. Work is held by toggle clamps attached to pallets

for a length of about ¼ in. Bare ends then pass under a rotating wire brush which is moved through a horizontal arc by a link which rocks the motor about a vertical pivot. This removes any burrs or bits of oxide and leaves the terminals clean and bright for assembly of the bus bars.

Cutter teeth are set to form a slightly dished surface so that when a seal of silicone varnish is applied it will flow to fill the dish and effectively seal the exposed end of the hygroscopic magnesium oxide. The assemblies are passed through a conveyor oven and heated to 1000 F. for ½ hr. to insure complete dehydration, and the varnish is applied while still hot.

Assemblies are given a test for grounds and open circuits by passing 1250 v. across the heater unit terminals, and then the four bus bars connecting the thermostat control into the electrical circuit are assembled. A second electrical test follows, after which the parts are conveyed to an automatic polishing and buffing machine where the bottom faces and sides of the castings are given a high polish.

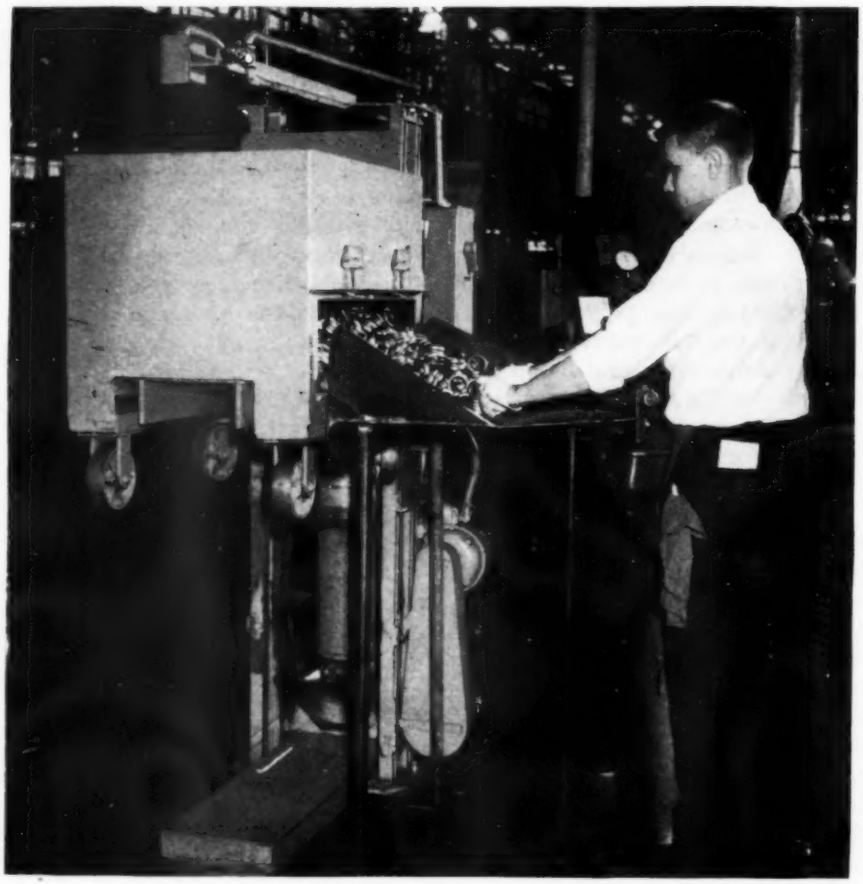
A chain conveyor subsequently carries the parts through an automatic washing machine and to another floor for final assembly. To facilitate assembly, the casting subassemblies are fastened by a toggle clamp to a pallet held on a conveyor belt by a pivot pin which fits inside a rib formed in the center of the pallet. The ends of the pins are carried in short bearings riveted to the edges of the belt. This permits pallets to rock with the pins as they pass over the pulleys at the ends of the belt. Pallets are sprayed with a coating of flock to avoid injury to the highly finished bottom surfaces of the work. Spring-suspended, air-operated nut- and screwdrivers are used, and motion conveyor is slow enough for operator comfort.

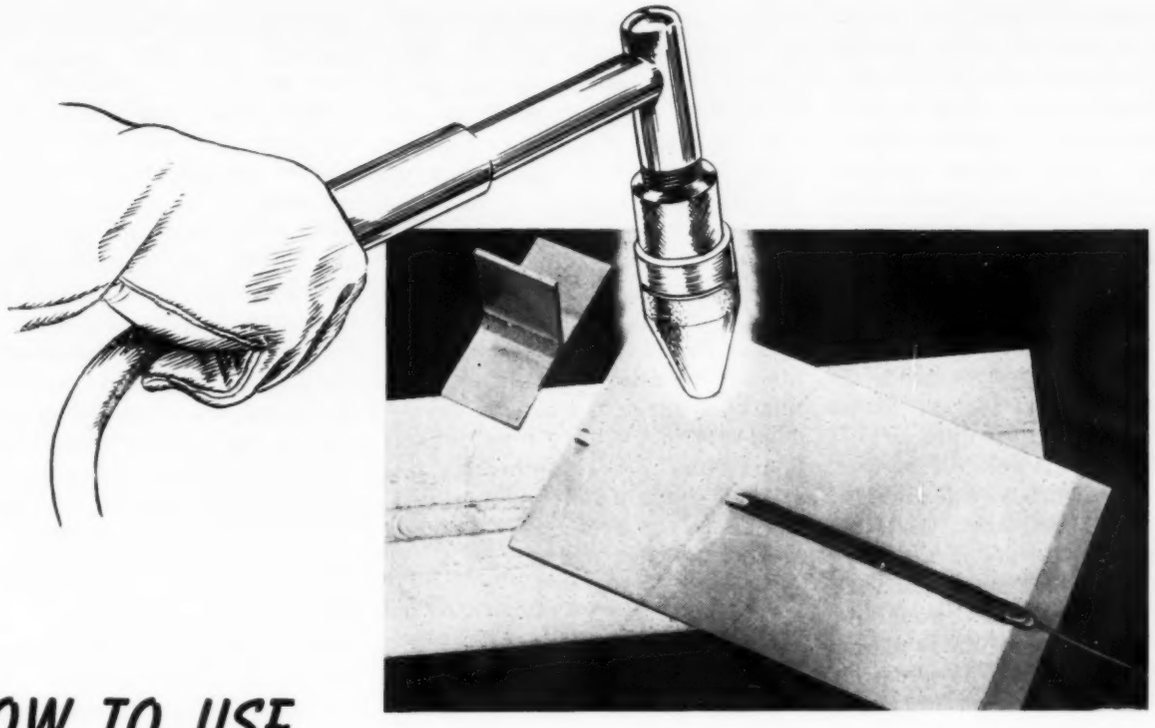
Special Hoist Reduces Parts Handling

A SPECIAL HOIST, a four-wheel cart, and a work tray are combined to improve handling in this setup at a New Departure plant. Parts are available at the proper working height and the long, fatiguing motions that are required to remove parts from a cart resting on the floor are eliminated.

The cart has two swivel casters and is easily positioned over the lifting section of the hoist. The cutout section into which the lift fits is proportioned to eliminate any tipping moment. When the loaded cart has been raised to the proper height, sliding clamps on the side are operated and the gate is removed to permit parts to flow onto the work tray.

The work tray is wide enough to allow both hands to work simultaneously and is at the right height for easy loading of the chute along which parts feed into the centerless grinder.





HOW TO USE

Helium-Shielded Arc Welding

BY HAROLD O. JONES, Welding Specialist, Technical Sales Division, Air Reduction

HAMPERED for many years by the scarcity and high cost of helium and argon, the process of arc welding with a shield of inert gas found its first large-scale industrial application in the early war years. A practical process for welding magnesium was urgently needed, particularly for aircraft work, and almost simultaneously, the compressed-gas industry found itself in a position to supply the necessary gases in large quantity and at reasonable price.

The ability of the process to produce sound welds without the use of flux, the high welding speeds attainable, the narrow, even beads, excellent penetration, freedom from spatter, and the absence of oxide, flux and slag inclusions quickly led to its adoption on aluminum and its alloys, stainless steel and other hard-to-weld materials. These now form the broadest field of its application. The extremely high, concentreated heat and freedom from distortion make it particularly useful on light gage metals, and although it can be employed on heavy plate, present practice usually limits it to work under ½ in. thick.

Inert-gas-shielded arc welding is not a panacea for all welding troubles; it must be judiciously applied, and every separate application must be carefully studied to strike a balance between the substantially higher costs over ordinary arc welding, and the improved quality and higher speeds obtained with the shielded arc. For average work on low-cost materials the process is neither necessary nor economical, but its rapid development and the introduction of automatic equipment point the way to its eventual use on cheaper materials, or conversely, to the use of higher-grade materials on work where present high processing costs make such materials impracticable.

A SPECIAL American Machinist REPORT TO THE METALWORKING INDUSTRIES

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INERT-GAS-SHIELDED arc welding is known under several trade names, including Heliwelding (Air Reduction Sales Co.) and Heliarc (The Linde Air Products Co.). In the process, welding heat is supplied by a concentrated arc between a non-consuming electrode and the work, while the electrode, arc, and weld area are blanketed by a monatomic inert gas. It differs from metallic-arc welding in that the electrode is non-consuming and the arc shield is completely inert. It differs from atomic hydrogen welding in that the arc is drawn between a single electrode and the work, and the gas shrouding the arc is inert. It is, therefore, a distinct and individual welding process, with capabilities and limitations of its own, and must be considered as separate from other arc welding processes much as stamping and forging are distinguished.

Information and knowledge about the process is in a constantly fluid state, shifting and reversing itself from day to day, although basic principles are beginning to be clearly understood. Many things once accepted as critically important have proved to be only minor. Present knowledge and theory are constantly expanding as they have for almost thirty years.

Antecedents of the process are found in the earliest records of arc welding itself. As early as 1890, just one year after a patent was issued on the basic arc welding process, an inventor patented the idea of a relatively inert (carbon dioxide) shield around a bare wire electrode. While this was closely related to the development of coated electrodes, the central germ of the theory was a lineal ancestor of the inert-gas-shielded arc.

Inventors continued to search for means of improving both the process and its results. They had two basic starting points, bare-wire welding, wherein the electrode was deposited; and carbon-arc welding, wherein the electrode was nearly non-consuming. About 1920, Churchward[1] developed a non-consuming tungsten electrode as a development of carbon-arc processes. Tungsten provides one of the two basic elements of the present process—a non-consuming electrode capable of carrying high current densities. The second element, a means of protecting tungsten and weld from oxidation at the high temperatures resulting from this concentrated arc, was developed late in the 1920's by Hobart[2] and Devers[3], one using helium, the other argon, both monatomic inert gases, as a protective medium around the electrode and arc.

Foreign Developments

Similar developments and studies, were going on in other countries, particularly Germany and Japan, and the former had developed the process to a production basis even before World War II. Inert-gas-shielded welding was extensively used for welding magnesium parts of the *Messerschmitt* 109 and 112 warplanes, with full success, as early as 1939. While other countries had no source of helium, and worked only with argon, they seem to have been at least one step ahead of the United States in capitalizing on the possibilities of inert-gas-shielded arc welding.

In the United States, while the basic knowledge was available some twenty years ago, most of the work with the process was limited to research studies and experiments and local attempts at special applications. Its wider use and development was hindered by two factors. One was the relatively high cost of the two possible shielding gases. Comparatively low demand and high refining costs kept the price of helium or argon impractically high. Further, until the last ten years or so, there was not enough demand for a process with these particular characteristics to spur its development and create the increased demand for the gases which would lower their cost. Basic research, such as that carried on under Professor Doan at Lehigh University, was about all the attention given the process until a contemporary development came to fulfillment in mass production of magnesium. This coincided with a sharp expansion of argon production by the oxygen industry and with an increased helium production by the Bureau of Mines, which lowered the prices of these gases.

In 1939, when magnesium first became a commerically fabricated metal, it was practically a new material. As it did with other metalworking processes, magnesium presented special problems to welding. Researchers found that the inert-gas-shielded process worked safely and well. Great quantities of magnesium were required by the aircraft industry—and, almost simultaneously, the compressed-gas industry was in a position to supply argon and helium at prices that made the inert-gas-shielded arc process economically attractive. Then began what proved to be the second of three phases of the history of the process. The first phase was invention and laboratory experiment; the second was proving the process under war conditions; the third, beginning about 1946, is its development as a major production tool. It is this third phase with which this report will deal.

Basic Features

IN this type of welding, there are three key elements—the electrode, the arc, and the gas shield. Each contributes something to the others, and to the effectiveness of the welding operation.

ELECTRODE:
Non-consuming, adding no metal to the weld. Carries high current density, concentrating heat.

ARC:
With suitable current, can break and lift oxide films, eliminating fluxes.

Intense and concentrated, produces narrow, even bead, good

[1]U.S. Patent #1,423,914, issued July 25, 1922, and assigned to Wilson Welder and Metals Co.

[2]U.S. Patent #1,746,081, issued Feb. 4, 1930, and assigned to General Electric Co.

[3]U.S. Patent #1,746,191, issued Feb. 4, 1930, and assigned to General Electric Co.

penetration (varies with current type).

GAS SHIELD:

Protects electrode from atmosphere, permitting high currents and heats without tungsten oxidation.

Protects weld metal, while molten, from atmosphere attack.

Ionization characteristics aid arc maintenance.

Key Features

These interrelated characteristics contribute certain key features to the inert-gas-shielded arc process:

High welding speeds are available from the intense, concentrated heat.

Fluxes are eliminated even on the rapidly oxidizing, hard-to-weld metals. Weld quality is high—free of oxides, flux and slag inclusions, and metallic dilutions or additions.

Post-weld finishing is reduced —small, even beads, free of flux, spatter, and slag, require less grinding, often none at all.

Weld bead is readily controlled —variations of current, electrode size, etc., permit accurate control of penetration and width.

High heat and controllable bead permit welding of very thin materials.

High speeds and concentrated heats minimize distortion and other undesirable heat effects.

These features point the way to the work and materials for which the process is best suited. Its ability to weld the rapidly oxidizing problem metals, for instance, without the use of flux, and to weld thin sections with minimum distortion make it ideal for joining such metals as magnesium, aluminum, and their various alloys. The elimination of flux, minimization of heat effects such as carbide precipitation and distortion, make the process well suited to stainless steels, particularly in thin sections. The quality of the welds, and the minimized finishing requirements, indicate its use for high-quality work requirements, where sound welds, good appearance, and smooth finish are needed, and for work where material and fabrication costs dictate predictable consistently excellent results.

Basic Advantages

Translating these advantages into broader terms, the process offers four basic advantages:

1. Speeding operations without sacrifice of quality. It is the fastest high-quality welding process in its field.

2. Simplifying tough welding jobs. It is the simplest and most reliable way of welding problem materials and work.

3. Accomplishing otherwise impractical welding jobs on materials too thin or otherwise unsuited for other welding techniques.

4. Improving quality (strength, toughness and finish) on critical-requirement work.

The problem for industry is successful application of the process to the job at hand, and every individual job is different. For, while this welding process is by no means critical, it is highly flexible, and minor variations in the work may mean a considerable variation in the procedure to obtain optimum results. The variables are interrelated and interdependent, so working out operating procedures for a given job always requires a balancing of the variables to obtain the desired effect. Proper preparation of the work, design of the joint, and general attention to quality details all around are also important. Further, sound application of the process calls for sound operation — well-trained operators, good supervision, and maintenance of high standards at all times. It is not a process to be applied casually; but soundly applied on the basis of a few fundamental principles, it becomes a relatively simple operation.

The fundamental principles center around obtaining a proper arc, which is a function of welding current and electrode size, and a proper gas shield for the electrode, arc, and weld.

Welding Currents

ALTERNATING current, direct current straight polarity, and direct current reversed polarity are all used. The type of current is chosen to suit the application, each type having characteristics which best adapt it for certain materials and jobs.

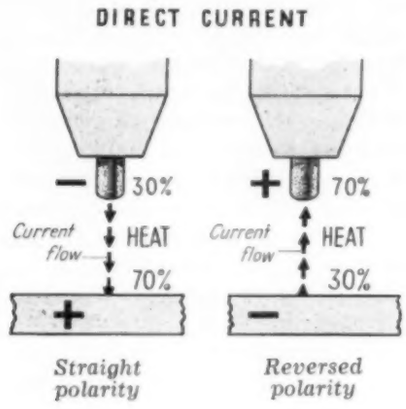
The fundamental difference between dc polarities, straight and reversed, as far as welding is concerned, is a difference in heat distribution. Both currents give inherently stable arcs, and can be readily obtained from standard dc welding generators. There is a marked difference, however, in the amount of heat delivered at the ends of the arc. Heat distribution is divided in about a 70-30 ratio. Straight polarity current delivers the 70% of heat at the work. Reversed polarity delivers the 30% of heat at the work. Consequently, straight polarity, concentrating heat at the work, permits higher currents on the same size electrode, and yields deeper penetration, higher speeds, and a relatively narrow deep bead; reversed polarity, concentrating heat at the electrode, reduces the current capacity of the electrode, with less heat the work, produces a relatively flat, wide bead and shallower penetration.

There is an important function of reversed polarity current, however, which is the secret of eliminating fluxes. Reversed polarity has the inherent ability to break up oxide films on the work, permitting flux-free welding of such materials as aluminum and magnesium. Because of this characteristic, and the fact that magnesium requires less heat to weld, reversed polarity dc was adopted as standard in the early application to magnesium. In more recent work, however, it has been widely supplanted for almost all work by ac.

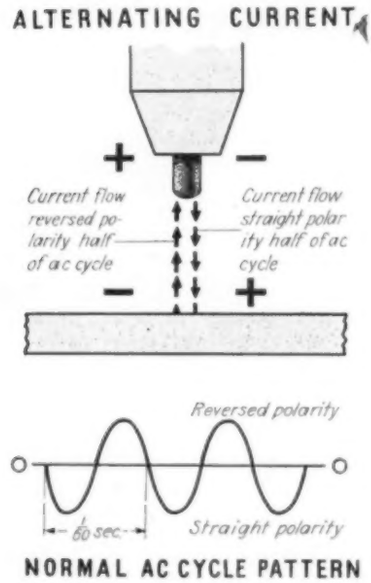
Alternating current, in principle, is a 50-50 combination of dc straight polarity and dc reversed polarity, and reverses, in cycles, between the two polarities. In effect, its straight-polarity component serves to deliver adequate heat to the work, resulting in satisfactory penteration and speeds, while its reversed-polarity component acts to break up the oxide film.

Alternating current does not im-

pose the electrode-capacity limitations of reversed polarity dc, although the same electrode cannot carry quite as high an ac value as it can dc straight polarity. Alternating current does not yield quite as much heat at the work as dc straight polarity, but the distribution is quite efficient, and an excellent degree of penetration with a medium narrow bead is readily obtained.



Current flow with straight polarity dc delivers 70% heat at work; reversed polarity delivers only 30%.



Heat distribution with ac is about equal, but differences in electrical characteristics of metals may produce an unbalanced cycle and partial rectification of current

Alternating Current Arc

By its very nature, ac presents certain problems which must be met for successful arc maintenance and efficient welding. Each cycle (and there are 60 per sec.), in going from straight to reversed polarity, passes twice through the zero point, with no current flowing, so there is a tendency toward an unstable arc.

This reversing of the cycle leads to another difficulty, arising from the fact that electrons flow with varying freedom from different materials. This difference, when it is sufficiently pronounced, as it is in a tungsten-aluminum arc, for instance, can lead to an unbalanced cycle. The reversed-polarity part of the cycle is the sufferer, and may be partly blocked, which will create a cycle pattern overbalanced on the straight-polarity side of zero. It may be so completely blocked, in fact, as to lead to almost complete rectification of the ac to straight-polarity dc. Because the function of the reversed-polarity wave is vital to the purpose of using ac, this rectification, if present in any important degree, is highly undesirable. It also wastes considerable quantities of available heat from the welding current through the secondary windings of the transformer.

Arc Stabilization

Both the inherent instability of the ac arc and the partial rectification of the current can be coped with by means of proper equipment.

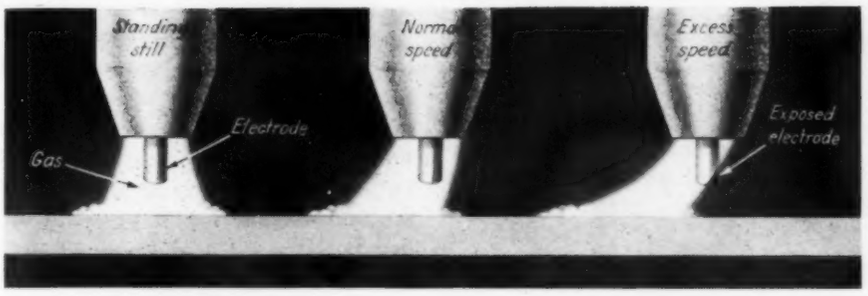
The ac arc may be stabilized by either (a) superimposing a high-frequency current on the welding circuit by means of a spark-gap type oscillator, or (b) use of a high open-circuit-voltage transformer. The oscillator method, which provides an ionized path for reestablishment of the arc after the current passes through the zero point, was at one time widely applied. Recently, however, its use has been restricted by the Federal Communications Commission because of the interference created in radio bands. There is a further drawback, in operation, because the secondary windings of standard ac welding transformers are not designed for high-frequency currents, and can be ruined by continued use with this method, so this combination provides, at best, a compromise current source. The high open-circuit-voltage transformer, however, has proven very successful and free of trouble, and is rapidly becoming standard.

The partial rectification is a comparatively simple thing to remedy, through the installation of proper capacitors (condensers) to block out the unbalanced dc component.

Generally speaking, production welding with ac should be done with an ac machine designed for the purpose. Such a machine would include: (a) sufficient capacity for the work, which is hard to obtain with the usual machines designed for coated electrodes on a 60% duty cycle; (b) built in capacitors to eliminate the dc component; (c) high open-circuit voltage for arc stabilization. Such special-purpose machines are now readily available, and by their use the difficulties inherent in the inert-gas-shielded arc welding process can be eliminated and the operation rendered as simple as any other welding process.

TYPES OF WELD OBTAINED WITH DIFFERENT CURRENTS

Comparative penetration of various types of welding currents. With all factors constant except the type of current, the depth of penetration and the form of the weld bead will be approximately as shown



Gas coverage of electrode as varied by speed of electrode travel. With gas flow constant and speed increasing, electrode becomes uncovered and burns when speed of travel overcomes velocity and/or inertia of gas flow

Electrodes and Gases

In general, the size of the electrode is selected to work at or near its maximum current capacity. This concentrates heat and provides high speed and penetration, with a minimum size of weld bead. There are, however, applications where larger electrodes will be desired to operate below full capacity for a wider, shallower bead. The capacity of an electrode will vary with the gas flow (which has some appreciable cooling effect) and with the design of the electrode holder and the particular operation being performed.

Carbon electrodes have been used on some special applications but the great bulk of the process is, and probably will be, done with tungsten electrodes. These are available in lengths up to 18 in. and in diameters from 0.040 in. up. Some electrode contamination may be caused by contact with weld metal, particularly with aluminum in manual work. Some electrode tip deformities may also arise, but in either case it is simple to break off a small portion of tungsten and so have a new, clean tip for welding.

Available Gases

The two commercially available monatomic gases, argon and helium, while both suitable for welding operations, are not interchangeable or equally effective. Much remains to be learned through laboratory work and practical tests before definitive statements can be made about many of their characteristics. Present shielding-gas theory is too often clouded with conjectures and half-facts.

Both gases are inert. No chemical compound of either has ever been found, either natural or synthetic. They are monatomic, that is, the atom of the gas is also its molecule, whereas the active gases such as hydrogen and nitrogen form molecules of two or more of their own atoms. With such complete inertness, either gas in adequate flow provides a chemically inert blanket around the heat area of electrode, arc, and weld metal.

Gas Flow Requirements

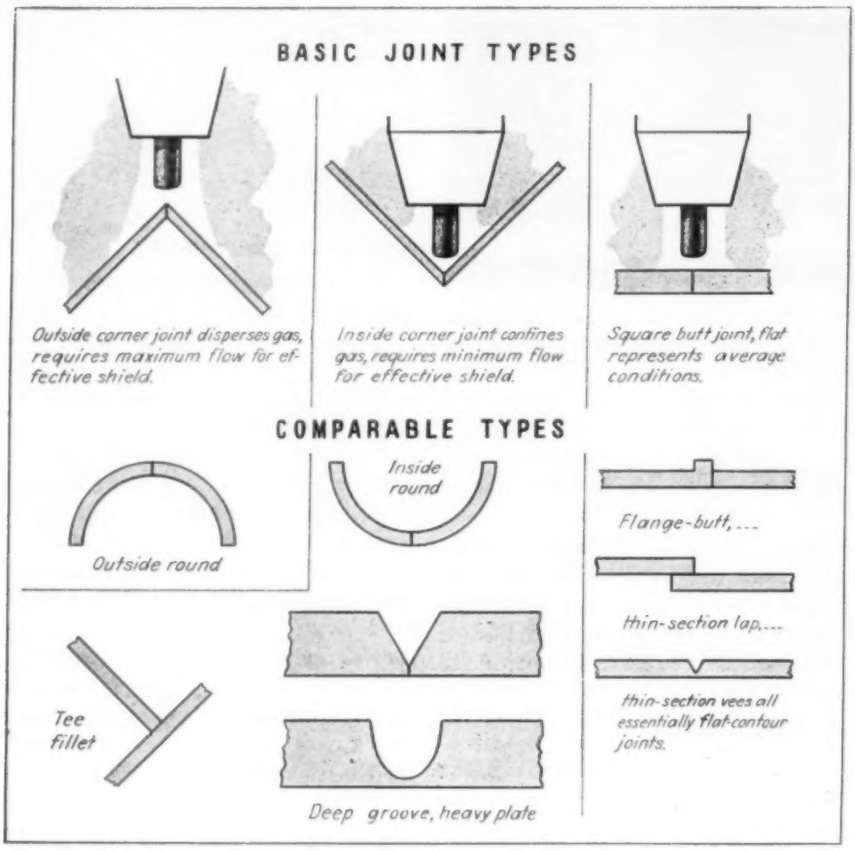
The principal requirement of the gas shield is that it be of sufficient volume and velocity to cover the relatively small area involved, and a suitably designed gas nozzle is used to direct the gas at low velocity (flows seldom exceed 20 cu. ft. per hr.) in a pattern for effective shielding at minimum gas consumption rates.

Certain factors, however, affect the flow requirements. The design and location of a joint may reduce or increase the flow required for effective shielding. Travel speed, if the electrode is moved over the work, can also affect the efficiency of the inert-gas shield. While position of the weld has only a slight effect, if any, this and other minor factors, such as drafts, may combine to increase the flow required, and the difference between optimum and minimum flows can be considerable. As the shielding gases are not an inconsiderable cost element, it pays to make every reasonable effort to attain economically satisfactory conditions for the job.

There is a considerable difference in the flow requirements between helium and argon, with helium requiring up to 50% more volume for effective coverage, but

GUIDE TO SELECTION OF ELECTRODE SIZES AND SHIELDING GAS NOZZLES

ELECTRODE DIAMETER (IN.)	GAS NOZZLE SIZE (IN.)	GAS FLOW CU./FT./HR.	DIRECT CURRENT (AMP)				ALTERNATING CURRENT (AMP)			
			STRAIGHT POLARITY		REVERSED POLARITY		H. O. C. U. (BALANCED)		STD. TRANSFORMERS WITHOUT CAPACITORS	
			HELIUM	ARGON	HELIUM	ARGON	HELIUM	ARGON	HELIUM	ARGON
0.040	3/8 I.D.	12-16	Up to 50	Up to 65	Up to 10	Not used	Up to 25	Up to 35	Not used	Up to 30
1/16	3/8 I.D.	12-16	50-125	65-150	10-20	Not used	20-60	30-85	Not used	20-115
3/32	3/8 I.D.	12-16	125-225	140-280	20-35	Not used	50-100	75-130	Not used	100-185
1/8	3/8 I.D.	15-18	200-300	250-375	25-50	Not used	75-175	100-200	Not used	150-225
3/16	3/8 or 5/8	15-20	250-350	300-520	30-75	Not used	150-240	175-300	Not used	200-340
1/4	5/8 I.D.	18-25	300-475	420-600	40-125	Not used	200-330	275-410	Not used	300-445
5/16	5/8 I.D.	22-30	430-550	—	110-160	Not used	300-420	380-490	Not used	400-560
3/8	5/8 I.D.	25-35	530-600	—	140-190	Not used	400-500	460-600	Not used	500-670


BASIC JOINT TYPES
Outside corner joint disperses gas, requires maximum flow for effective shield.
Inside corner joint confines gas, requires minimum flow for effective shield.
Square butt joint, flat represents average conditions.
COMPARABLE TYPES
Outside round
Inside round
Flange-butt, ...
Thin-section lap, ...
Thin-section vees all essentially flat-contour joints.
Tee fillet
Deep groove, heavy plate

Joint design materially affects the extent of gas coverage, depending upon the extent to which the shape of the joint tends to concentrate or disperse the shielding gas as it leaves the orifice

the difference in their costs puts them on a competitive basis, Hence the factors governing a choice between the two gases are reduced to availability, suitability for shielding and suitability of electrical characteristics.

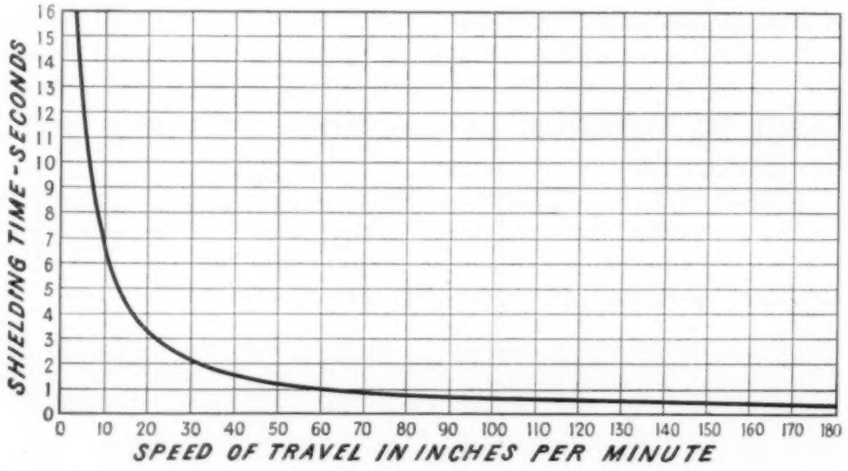
In the past, there has been a tendency to consider argon the better shielding gas for some work, particularly on aluminum. Helium, however, of the old standard commercial purity (98.5%) is fully effective for most applications. Recently, helium of high purity (99.6% or better) has been made available in quantity, and this development has cleared up the obstacle to using helium with full success for aluminum work. This difficulty in aluminum welding with helium of lower purity arose from the character of the impurities—largely hydrocarbons and hydrogen — which caused weld contaminations. With the elimination of virtually all such impurities, helium is proving quite as satisfactory for aluminum welding as it has been for stainless steel, nickel, copper and other important materials.

There is a difference in electrical characteristics which may affect a choice of shielding gas, namely a difference in the arc voltage at a given amperage of welding current. This tends to favor helium, because the arc voltage, and the effective arc heat, with that gas is appreciably greater than with argon at the same current value. Consequently, higher welding speeds, or greater penetration, are possible with a given current value, and are a worthwhile advantage in many production operations. For example, if dimensional limitations dictate a certain size electrode on a given job, helium might provide enough extra heat for either greater penetration or higher speed than will argon in the same work with the same current capacity and same size electrode.

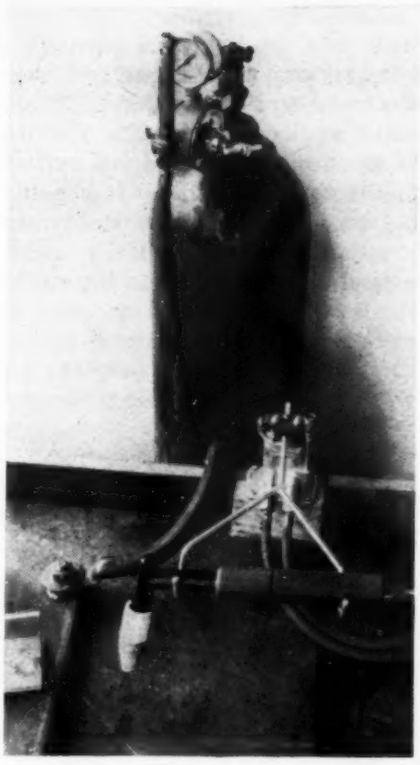
While either shielding gas will permit a smooth, stable arc, however, the use of argon as the shield will permit a longer arc to be readily maintained. This has some importance in work where the electrode cannot be brought as close to the joint as might be desired, and in some manual operations where the arc length is necessarily variable because of the human element.

Gas Flow Control

The only other factor of importance in consideration of the shielding gases is the means by which they are controlled. For economy and accuracy, a two-stage regulator and a flowmeter (preferably calibrated in cu. ft. per hr.)



Weld coverage varies with speed of travel. With gas flow constant and speed increasing, time of protection for 1-in. increment of weld drops until flow must be increased to provide the required protection. The danger point will vary with different types of materials



Two-stage regulator and flowmeter calibrated in cu.ft. per hr. are standard means of controlling and measuring gas flow. Modified Gas-Saver, foreground, supports torch and is an inexpensive and convenient means of gas control for manual operations

are standard. To reduce gas waste, some sort of automatic or operator-controlled gas cut-off device should be provided near the work, and whether it be a modified Gas-Saver for manual operation, a remote-control valve or switch, or an automatic device connected to the welding circuit to cut off when the arc breaks, it should provide a means of continuing an after-flow of gas for a few seconds to shield the hot tungsten from attack by the atmosphere.

Naturally, in arranging the gas-supply equipment, it is vital to use hoses, fittings, etc. which will insure a supply free of contamination by hydrocarbons, water, other gases, or the atmosphere. This means that equipment must not have been used with such materials in the past, and requires thorough purging of the lines before welding. These measures, with high-purity gas to begin with, insure an effective gas shield for complete protection of the weld area, the arc and the electrode.

Scope of the Process

INERT-GAS-SHIELDED welding is a versatile process. With the range of possible combinations of currents, gases, equipment and techniques available, it can be applied to practically all joint designs and all types of weld, over a wide range of materials and thicknesses. Many of the possibilities, however, are minor applications. The wide fields of use are in the more popular non-ferrous metals, aluminum, magnesium, brasses, Monel, Inconel, Everdur, coppers, and in stainless and high-alloy steels. Of these, the large-scale applications are in the rapidly growing aluminum and stainless fields, use on other materials being roughly in proportion to the degree to which they are fabricated.

Properly applied, the process can be successfully used on the very thinnest commercial materials and up to very heavy plate. The high speed and concentrated arc permit welds in materials as thin as 0.010 in. Multiple passes with added filler metal take care of very heavy plates. The peak efficiency, however, is usually on work under ½ in. thick, and particularly on the thinner materials of gage thicknesses which, except for aluminum, can almost always be welded without filler metal. (This last applies, for instance, to square butt joints in stainless steel, for a wide range of uses, and simple means of providing self-contained filler metal further extend the possibilities of such applications.) Almost invariably, however, aluminum does require added filler metal, which may be provided from the material itself by flanging, by preplacing, or by an externally fed rod.

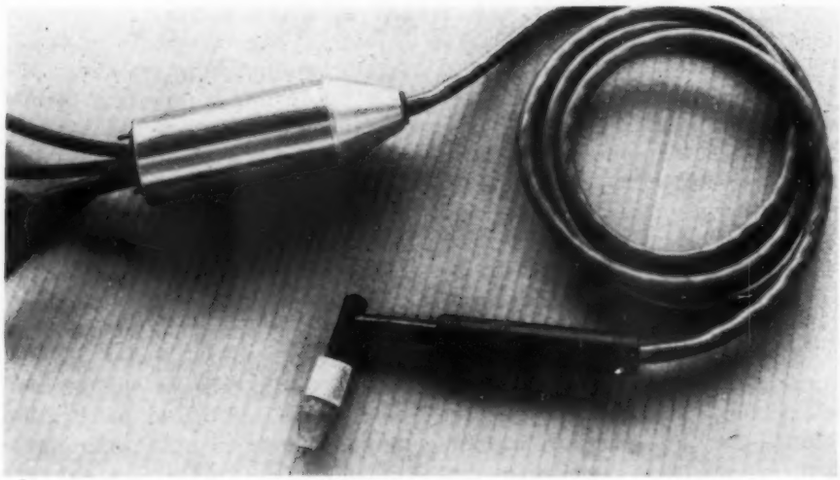
High Speeds Attained

Depending upon the job, welding speeds can be remarkably fast. Speeds up to 6-8 fpm. are not unusual with machine equipment, and special setups have attained speeds several times as fast. Almost invariably the process will prove faster than any alternative means which could yield equivalent results. It has almost entirely supplanted other welding processes in the production of stainless tubing, for instance, replacing atomic hydrogen welding on the basis of twice the speed and better-quality welds, with no change in the manufacturing process except the substitution of the special automatic head in the mill.

Weld quality is highly satisfactory. The appearance of the bead is smooth and relatively narrow, without slag, flux, or spatter, and both bead width and penetration are subject to a considerable range of controllability. Physical strength of the joints is also excellent, within the natural limits of any welded joint, with high toughness and sound metal. Elimination of slag and flux removes any risk of inclusions in the weld, also eliminates the potential threat of corrosion resulting from improper cleaning. In every way these welds will meet the highest quality standards.

This quality factor is a strong indication of the economic scope of the process. There is no denying that the inert-gas process is a relatively expensive type of welding, and it would be foolhardy to expect satisfactory cost-result relationships on work which does not require top quality. In most cases, however, the materials upon which the process is most successful are expensive metals, used in high-quality products, and the results desired more than warrant its use, regardless of cost.

Because of the type of material on which it is used, and the number of variables involved, some care must be used in selecting equipment, training operators, and setting up the work. Properly designed and properly jigged work, in the hands of a well-trained operator, with good equipment arranged for the job, make such welding a routine and consistently satisfactory operation. Badly designed joints, improper jigging, half-trained operators, or jury-rig equipment, can readily lead to failures. It is only common sense to eliminate the risks in advance, by careful planning and, whenever possible, using the guidance of men experienced in the process.



Heavy-duty, water-cooled, manual holder uses a single, light, flexible cable for high maneuverability and ease of operation, with an insulated connector block for lines to gas, current and water sources

Equipment Employed

THE fundamental "works" of any type of inert-gas welding equipment are the gas nozzle, the electrode, and the area blanketed by the gas shield. Theoretically, all that is necessary is a means of bringing the gas to the nozzle, and the current to the electrode, and holding the assembly in position for welding. That is the basic function of any setup, however complicated it may become.

To achieve certain corrollary objectives, in addition to or in connection with, the actual welding operation, however, the equipment may become very complicated. Various types of adjuncts to the basic current source have already been described, as has the simplest means of controlling, regulating, and measuring gas flows, but many other variations and additions to the basic setup can be required by various kinds of jobs.

Thus far, three types of equipment have been developed and are widely used. Each has a definite place, and each does certain things the other cannot do efficiently, if at all. These are (1) Manual equipment, (2) Machine equipment, and (3) Automatic equipment.

Because the high currents now used for higher speed, greater penetration, and heavier materials generate great quantities of heat, all three types of equipment are water cooled. (Although non-cooled manual equipment for light, intermittent duty at low currents is available, it is not considered as a real production tool.) All production types are insulated to carry safely the heaviest current loads which can reasonably be expected, and built for heavy-duty full-production uses.

Aside from variations in capacity, the only real difference in the three types of equipment is the way in which they are positioned and/or moved in relation to the work. Manual equipment is readily maneuvered and controlled by the operator's hand and arm. Machine equipment is mounted in a fixed bracket, and either traversed over the work mechanically, or the work moved under the arc mechanically. Adjustment fittings built into the holder bracket permit minor adjustments of the electrode-work relationship. Automatic equipment, through a series of electronic circuits, drive motors and automatic devices, is capable of maintaining a constant arc length, and is vertically self-positioning in relation to the work. It also strikes its own arc, and is equipped to actuate a motor-driven carriage to traverse either the work or the head itself when the arc is struck.

The usefulness of manual equipment is fairly obvious. Whenever joints are short, irregular, or hard to reach, or when the quantity or uniformity of the work does not justify more elaborate methods, manual welding is indicated. Manual equipment is light, easy to use, and can go with the operator to the work without difficulty.

Machine and automatic electrode holders are mass-production tools. Reference has already been made to the use of automatic heads in tube mills, and this is a prime example of the usefulness of the automatic arc-length control, wherein the bead is held to extreme accuracy of contour, penetration and quality. Other applications are elliptical or oval girth seams, rotating under the arc; work in which precision jigging and alignment are not possible, or any job where the contour changes smoothly in a vertical plane over the length of the joint, and where the work or the welding head can be readily moved along the joint.

The far simpler and less-expensive machine electrode holder is the same production tool without the automatic control circuits. It is

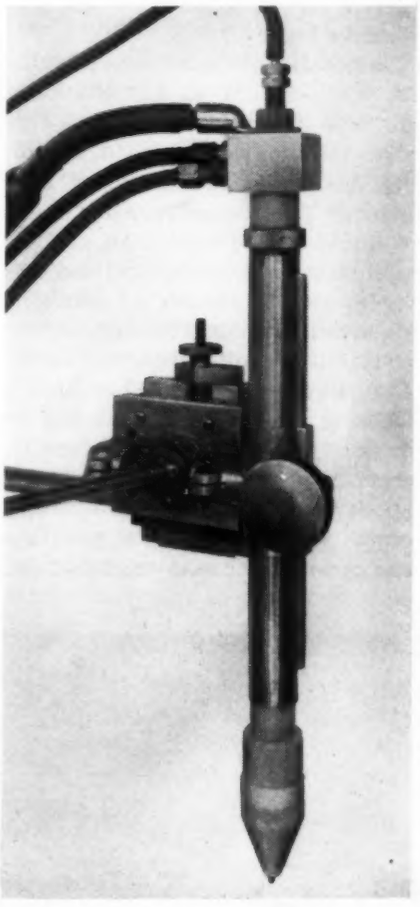
ELECTRODE HOLDER CAPACITIES

TYPE OF EQUIPMENT	ELECTRODE SIZES	RATED CURRENT, AMP. DC	AC
Air-cooled manual holder	1/16, 3/32, 1/8, 5/32, 3/16 & 1/4	125	125
Water-cooled manual holder	0.040 — 1/4	475	400
Machine holder	0.040 — 3/8	600	600
Automatic head machine holder	0.040 — 3/8	600*	600*

*The contactor built into controls for automatic head is for 300-amp. For higher currents, a separate contactor must be provided.

suited for repetitive work where jigging and joint contour are consistent, without change in the vertical alignment, and this applies to the bulk of mass-production operations. It can also be mounted on pantograph-type cutting machines, and with a suitably accurate templet for a magnetic or spindle tracer, be used to weld irregular contours within a single horizontal plane, such as might be presented by an elliptical plug in a plate.

Many means of mounting the automatic and machine holders are available, ranging from simple moving fixtures to elaborate gear-driven positioners for the work, with fixed bracket setups for the holders, and from standard radiagraphs to specially built travel carriages for the welding unit, with stationary work. The basic idea remains the same, however, and such mechanisms, as a rule, should be kept as simple and economical as possible.



Machine holder with standard flame-cutting torch fittings for fixed or movable operation. Universal positioner with ball joint provides quick, accurate positional adjustments in any direction

There are many auxiliary controls and safety devices which may be used with the fundamental equipment either singly or in a considerable variety of combinations. Such controls are usually required to:

Provide at-the-work starting and stopping of welding current;

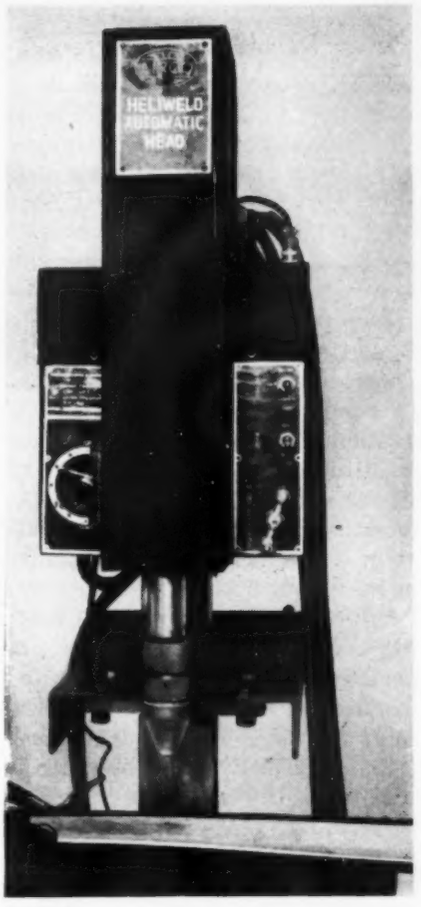
Provide gas-saving at-the-work control of shielding gas flow; or

Protect equipment against cooling-water failure.

Controls Required

At-the-work control of welding current is obtained by a suitable switch actuating a contactor of sufficient capacity for the currents in use. This may be located in any convenient position, if used separately, and the switch may be a foot switch, hand switch, or trip mechanism, according to the requirements of the setup. Generally speaking, a foot switch is most valuable with manual equipment; a hand switch is best suited to the operator of a machine setup; and a trip switch or other more complicated arrangements operated mechanically or electrically by the travel mechanism, can only be applied in production work with machine or automatic equipment.

At-the-work control of gas flows is almost always only a matter of starting the gas flow as close as practicable to the time of starting the arc, and stopping it, with a suitable after-flow period, at the end of the weld, to avoid waste. Such a device is incorporated in the control circuit of the automatic welding head, and can be rigged with a suitable valve for machine setups. For manual work the simplest and most practical setup is usually the modified Gas-Saver. This device provides a purge of the line through the holder, and an after-flow to protect the glowing electrode during the time lapse between lifting the holder and moving it to the work, or breaking the arc and hanging up the holder. This same feature is incorporated as an automatic function in the control circuits of the automatic head. With a machine setup, unless automatically controlled for this purpose, the time delay can be made part of the operator's work cycle.



Automatic head employs electronic control actuated by variations in arc voltage to maintain precisely constant arc length. Automatic touch starting and after-flow of shielding gas provide maximum degree of automatic operation

In some cases, it is necessary to provide protection against failure or interruption of the cooling-water supply, particularly in using the manual equipment, in which cooling is essential to protect both the power cable and the lighter construction of the holder itself. Even a brief period of stoppage can cause serious damage with manual holders, although the heavier machine holders can stand substantial interruptions without damage. Unless a secure and direct source of water is readily available, a water interlock device should be provided to cut off welding current by activating a contactor or to operate an alarm, if the flow drops below a preset level. A further auxiliary is a filter, to prevent even fine particles of foreign matter from enter-

ing the restricted water passages and causing an internal stoppage.

These accessories may be used separately, or all together, but in any case, the greatest advantages will be obtained only if the controls can be centralized at a convenient position near the work, to provide maximum simplicity and facility of operation. This can be done, either by grouping individual control devices or by installation of a specially designed control unit. This unit permits push-button activation of a master control circuit resulting in automatic operation of all the required devices on an interacting basis, and affords maximum convenience and reliability in minimum space.

But whatever the means adopted, simple or elaborate, the important thing in setting up an installation is to obtain the best setup for the job at hand, economically, physically, and for the best results quality-wise.

Joint Design and Jigging

SEVERAL REFERENCES have been made above to the importance of proper joint design and jigging. While there is practically no limit to the types of joint which can be produced, some joints are better and easier than others, and this should be born in mind. Joint preparation, however, is the more critical factor. Most materials for which this process is widely used require thorough cleaning for satisfactory welds. Edge preparation to assure good fitup is also important, particularly for lap and square butt joints, and for any joint to be made without added filler metal. More elaborate joint preparations, such as double-vees, grooves, etc., should be prepared as carefully as possible, although with the sizable filler metal additions in such cases, fitup standards are not so exacting.

Except for the comparatively rare self-jigging joints, soundly designed and built jigs and fixtures are essential, particularly when working with thin materials. Such jigging may range from the final rolls of a tube mill to large and elaborate precision units, but the criterion is still the same, establishment and maintenance of good fitup, minimization of distortion, and suitable heat distribution characteristics, in as efficient a unit as possible.

Process Procedures

IN DEALING with procedures for welding a given material, the information is scattered, often uncertain, and incomplete. This is to be expected of a process which has so short a history as a production technique, and one whose users are not yet sufficiently numerous or varied to provide the mass of data from which exact principles and figures can be worked out. Welders, therefore, although on much surer ground than a year ago, are still working in the dark to some extent. Most of the details of a given job are still worked out by trial-and-error methods, along the general lines so far established. The following data, therefore, can be given only as a guide to the process, not as hard and fast rules for setting up an operation.

Stainless steels are probably the most readily weldable of all the major materials suitable for inert-gas-shielded welding. The process is quite simply applied to the chrome-nickel series, and the straight chrome series present only the problems usual to this category when welded by any means. Weld appearance is generally good, and finishing requirements, an expensive consideration with stainless steels, are reduced to a minimum. Weld quality is the best obtainable. The carbide precipitation problem, which tends to lower corrosion resistance in a narrow band adjacent to the weld, is minimized or eliminated by the very brief period of heating possible with the intense arc and resultant high welding speeds available.

Most production welds on stainless steels are made without filler metal. Butt joints up to ⅜ in. can be made without filler by using a pass on each side, and one-side single-pass welds with full penetration can be obtained on ¼-in. material using a ¼-in. electrode and 300 to 400-amp. dc straight-polarity. In the opposite direction, material as thin as 0.010 in. can be welded (usually using argon with either ac or dc straight-polarity to reduce the heat somewhat) and the speeds on such material are extremely high.

Generally, stainless steel is welded with helium as the shielding gas, and dc straight-polarity. This gives maximum heat input, resulting in deep penetration and high speeds. This technique, of course, is advisable to minimize carbide precipitation on non-stabilized material, and to reduce or eliminate distortion problems on thin-section work. It is not considered advisable, however, to use too high a welding speed when that can be avoided, as peak speeds tend to produce a somewhat inferior weld appearance and increase finishing costs. With the wide range of analyses in the chrome-nickel stain-

Machine weld in 0.0625-in. stainless steel. Tab used for starting and finishing serves to eliminate irregularities at the joint ends

Ph

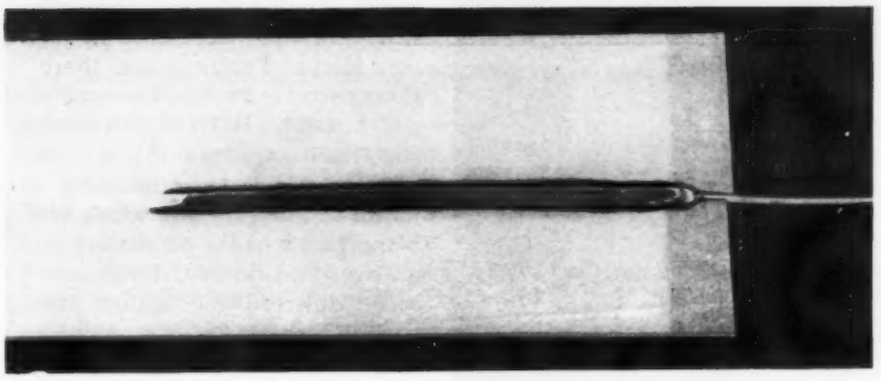
less alloys, there is naturally some variation in procedures for changes in composition. The important factor in this is the change in the heat-conductivity characteristic as the alloy content rises; 25-20 alloy will require a slower welding speed than 18-8 because heat dissipates faster and the arc requires a longer time to complete penetration of the joint.

The straight chrome (400 series) stainless alloys are as weldable with this process as with any other, but they do require preheating, careful handling, and slow cooling under accurate control to avoid faulty welds. The cooling problem also applies to chrome-nickel alloys of high carbon content, to avoid cracks. The over-all heat problem is also reduced on straight chrome or high carbon materials by a longer arc, which spreads the heat over a larger area and appreciably reduces the sharp temperature differential between weld and parent metal.

When filler metal is required for stainless-steel welds, it may be applied from filler rod, or more advantageously be provided by flanging one edge of the work, inserting a preplaced rod or strip edgewise in the joint, or by applying pressure to the joint as the metal is molten, to create the reinforcement, as it were, from the entire mass of material. Generally, however, for butt, corner lap, and edge welds (by far the most common types) filler metal will not be necessary if proper fitup, jigging, and welding procedures are provided.

These last elements are important in all welding of this type, but particularly so in stainless work, because of the critical requirements which usually apply to the products. With proper planning and attention to detail, stainless welding is a fairly simple routine operation. Flux, slag, and heat-effect problems are eliminated or minimized, and the results are the best obtainable by any method of welding stainless steel.

Plain carbon steels, unless fully killed, will show a tendency toward the creation of porous welds because of evolved gases trapped in the freezing weld metal, but otherwise they are weldable. At present, however, inert-gas welding is scarcely in a position to compete with older methods except in specialized instances. There is an interesting range of possibilities for future application of the process in this field, with extremely high speeds, for instance, contributing to high-production rates, or for welding very thin sections with the most satisfactory quality, and little, if any, distortion.



Preplaced strip of the parent metal is used for filler in this machine weld on stainless steel. Left-hand end is ground flush to show complete fusion

Work is being done, therefore, in solving the porosity problem. One means of providing a sufficient time in the liquid state for the gases to pass from the metal is the use of a flame preheat or postheat in conjunction with the welding arc. This slows the cooling rate enough to insure sound metal in the weld zone, and a completely satisfactory weld. On another tack, experiments are under way with finely powdered aluminum fed into the weld, to kill the steel on a tiny scale during the joining operation. These techniques, however, are not required unless the welds must pass such critical standards as X-ray examinations, and the quality can be made quite suitable for many other uses without any of these special measures.

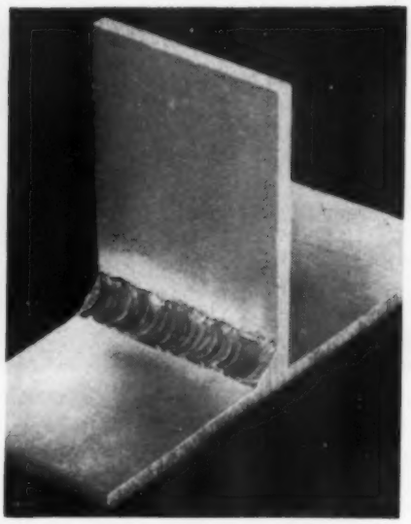
The usual procedure for carbon steels is helium and dc straight-polarity. The higher carbon ranges generally require a long arc gap and higher arc voltage, with welding at slower speeds to give a longer period in the molten state and slower cooling of the pool. Exact data on currents and speeds are difficult to pin down, for lack of data, but many carbon-steel alloys are being handled successfully. For instance, those in the 4330 range have worked out with considerable success in production applications, and as production or other requirements warrant, many other analyses will probably be added from time to time.

Nickel (commercially pure) is readily welded by proper procedures. Either ac and argon or dc and helium, which gives faster work, may be used. X-ray examination will show solid, homogeneous metal in either case, and nickel generally presents few problems, except for a tendency to porosity which can be eliminated by proper techniques.

Monel is readily weldable and the welds are quite satisfactory. There is, however, a bothersome tendency to form entrapped-gas porosity with this alloy, and if X-ray is required, special measures must be taken to hold the material molten long enough for the gases to escape. This can be achieved with an oxyacetylene preheat to about 1000 F. just ahead of the welding operation.

Otherwise, welding procedure for Monel is quite similar to that for stainless steel of the chrome-nickel types. Straight polarity dc with helium is used, and welding speeds are about the same, although the speed may have to be lowered to reduce porosity when preheat is not practical and requirements are high.

Inconel is ready weldable without particular difficulty. The basic procedure is the same as that for stainless steels—helium and dc, straight-polarity—and speeds and



Fillet weld in aluminum indicates the evenness of the bead and the good contour obtainable with well-executed manual operation

currents will also tend to correspond. Inconel tubing, for instance, of 0.030 in. wall thickness, is welded at about 10 fpm., with excellent appearance and quality.

Everdur is an alloy of relatively high heat conductivity, and therefore requires appreciably more heat in the welding arc than the previously mentioned materials. There is also some tendency towards gas porosity, particularly at the start of welding when the material is cold and acts as a quench. Flame preheat to 200 to 400 F. at that time will solve the problem, and it need not be continued once the weld is well started, as the heat of the arc itself is sufficient when the material has warmed up. Otherwise, the procedure with Everdur is also dc, straight polarity, and helium. As with all other materials, no flux is required.

Brasses of the commercial type are successfully welded, using either helium or argon, and dc straight polarity. Because of high heat conductivity (which characterizes all copper-base alloys), speeds available are slower than for stainless steels to a marked degree. Actually, brass welding is only from 50 to 70% as fast as stainless steel welding.

There is also some problem of porosity with brasses, varying with the type of alloy. High-lead and high-zinc brasses will give a porous weld because of burning out of the alloying elements, and there will be a color difference in high-zinc alloys. Furthermore, there is some porosity even in the commercial brasses. It is of microscopic size, and appears only in small quantities in the parent metal adjacent to the weld, the whole effect being, as a rule, of little consequence, and no real hindrance to successful results in welding these common materials.

Copper (electrolytic type) can be welded, but joints develop troublesome porosity, and it is not usually too successful a job. Deoxidized copper, however, is readily welded with only a trace of porosity in thinner sections which increases in thicker material unless preheating is used. Copper is welded with dc straight polarity, and helium, and is one of the slowest materials to weld because of its extremely high heat conductivity.

Magnesium, the material which is largely responsible for the rise of the inert-gas process, is not only weldable, but also this process is virtually the only means of welding magnesium and its alloys. At least, it is the only one in common use, and the only reliable method. Magnesium is so subject to corrosion that the presence of flux or slag in a weld area is a serious problem, requiring intensive efforts for cleaning, and even then, presenting a constant risk of attack. Further, this method yields by far the best weld appearance and quality, at the best speeds.

Magnesium represents the only sizable remaining use of reversed-polarity dc, with helium, and even that is subject to replacement by ac and argon. No flux is required with either method, and welds are metallurgically sound. Welding of magnesium, however, once so important a job for the process, has now become a subsidiary application, in spite of the large volume of the metal still being fabricated.

Aluminum, with stainless steel, makes up the overwhelming majority of applications. Until recently, the basic procedure for this metal required ac, and argon, and with this, bright clean metallurgically sound welds were readily obtainable. Helium was not satisfactory until the limitation of excessive hydrogen and hydrocarbon impurities from the 98.5% gas, to produce a 99.6% purity. High-purity helium is quite successful for aluminum welding, and will go far toward solving many major production problems.

In practically all cases, aluminum welding requires added filler metal, and this is not usually available except from filler rod. This has limited machine and automatic welding of aluminum to those jobs where filler can be readily fed automatically, and a great deal of aluminum work has required manual operation. With a suitable wire feeder, and the development of the ac automatic welding head, many aluminum jobs can now be adapted to automatic and machine methods, with resulting higher production rates and more controllable results. The very nature of many aluminum jobs, however, makes manual operations not only highly desirable, but mandatory, and this is one of the most useful fields for the inert-gas-shielded process.

The foregoing outlines the general factors and basic principles for welding most of the important suitable materials. The only satisfactory way, however, of investigating detail procedures with the kind of knowledge available today is the study of case histories, analysis of the incomplete data on hand, and finally, trial-and-error experiment with simulated or actual workpieces. Along the lines described above, however, success can be reasonably assured. It is largely only in such elements as exact current values and welding speeds, or the adjustment of shielding gas flow and electrode protrusion, or arc and electrode size, that precise guides cannot be set. Before long, however, many of these factors may be reduced to formulae, and in the meantime there is a variety of proved applications to serve as general guides.

In the following pages are presented some outstanding jobs that have been performed with inert-gas-shielded arc welding as regular production or maintenance operations. These will serve to illustrate the scope of inert-gas-shielded arc welding over a wide range of applications.

Case Histories

WHILE there is a tremendous variety of applications for this process, particularly when the relatively minor uses are considered, the bulk of its use is on stainless steel and aluminum, and of these, so far, most aluminum work has been under manual operation, with machine and automatic work largely confined to stainless steel. The chief cause of the division is the almost invariable need for filler-metal additions in aluminum welding, and the relative difficulty of providing it automatically.

For example, one aircraft manufacturer is producing, in quantity, a cigar-shaped wing-tip fuel tank, about 11 ft. long, composed of formed aluminum sheets, four for each tank-half. While each weld in this assembly is approximately a semi-circle, each is also of a somewhat different radius from the others, and aircraft requirements indicate a single jig to hold all the parts for distortion-free assembly.

Inert-gas-shielded welding was indicated for this job, because of the weld quality and finishing requirements, which are even more stringent than usual for military aircraft. Manual welding was the obvious method, to provide full adaptability for the varying joint dimensions, and for ease in adding filler metal. The parts, accurately formed, are fitted to a special fixture, held by toggle clamps, and the major joints further held, by straps, firmly against backup bars integral with the jig. The fixture rotates so the operator can weld downhand at all times, and runout tabs are incorporated in the parts, providing an area of surplus metal at the beginning and end of each joint for striking and breaking the arc. These tabs are sheared off after welding, so all weld metal in the final unit is completely sound. Sheets vary in thickness from 0.051 to 0.081 in., and joint preparation consists of wire brushing the edges.

Using argon, and ac with superimposed high frequency from a spark-gap type oscillator, the tank-half is welded at quite satisfactory speed for work done to such high standards. Gas flow, with welding under what could be considered average shop conditions, is 9 liters per min., and welding current of 70 amp. on a 3/16-in. electrode is used, with a 5% silicon filler rod.

When these tank-halves have been welded and finished—by a comparatively small amount of grinding—fittings are also installed by welding. Lap joints are used, with fillet welds, and except for somewhat higher current, the procedure is much the same.

Complicated Assemblies

In a somewhat different way, another shop, Production Engineers and Welders Co., Philadelphia, capitalizes on the maneuverability of manual welding to produce high-quality results in a complicated assembly of aluminum tubing and channels. The unit, approximately 30 in. high by 30 in. square, consists of a square base frame fabricated from 61ST channel, a framework of uprights and diagonal struts of 3/16-in. wall 61ST tubing, and top pieces of channel. The base is a relatively simple unit, requiring mitred-corner joints, and a crosspiece in the middle with butt joints. The tubing assembly, however, is complex, and presents a neat problem in the multiplicity of welds concentrated at the mid-points of the uprights. Four welds are made on the uprights within a few inches, and despite this potential distortion source, straightness of the uprights must be held within 0.015 in. By capitalizing on the heat characteristics of inert-gas-shielded welding, original distortion can be held to an absolute minimum, and what does occur is readily handled by special heat-control techniques developed by company engineers.

This tubing assembly is a good example of the value of flux elimination. It would be all but impossible to obtain positive assurance of complete flux removal from the inside of these joints, and there would be a constant risk of flux corrosion weakening the structure, if other welding processes were used. With this process, which requires no flux, the welds are free of such threat, and of superior quality.

Aided by accurate and well-engineered jigs, Production Engineers and Welders Co. obtains excellent results with these units. The welds are made at 135 amp. with superimposed high frequency, with a ⅛-in. electrode in water-cooled manual equipment, and a

Runout tabs (arrow) insure completely sound metal at the end of all welds on aluminum wing-tip fuel tanks for military aircraft. Rotating jigs permit downhand welding on all seams. Smoothness obtained on weld beads reduces costly and time-consuming finishing to a minimum

gas flow of 16 cu.ft. per hr. at a speed of about 10 ipm. Filler rod is silicon aluminum wire. Welds are ground smooth, and the complete unit comes out perfectly square and true in all directions.

The same company finds numerous other uses for the process, since one of its specialties is the difficult or unusual job, and many of these are best handled with this equipment. Typical of such work is a small part composed of a base with an exterior and interior flange and a formed top. The edge of the top, in conjunction with the inner flange of the base, forms a T-joint. The material is 1/16 to ⅛ in. 61ST aluminum, and is fillet welded at 10 ipm., with 80 amp. ac, using 16 cu.ft. per hr. of argon, and ⅛ in. electrode. The finished weld is ground and polished inside and out, and the unit is smooth, sound, and free of distortion.

Maintenance Application

Manual welding equipment is not only a production tool, but also a valuable maintenance tool where quantities of aluminum, stainless steel, or copper equipment are used and kept in repair. Such a case occurred at a mill of the Cannon Mfg. Co., Kannapolis, N. C. A peroxide storage tank, 10 ft. dia. and 16 ft. long, of ⅜-in. type 2S aluminum, required a new bottom, which was installed in an efficient operation at reasonable cost.

The old bottom was cut off mechanically, and the resulting edge beveled to 45° with a ⅛-in. land for alignment, and the same edge preparation was used on the new bottom.

The bottom was then positioned against the edge of the tank and drawn snug, and a strap fitting, made up for the job, attached. This fitting, of ⅜×4-in. band iron was provided with 6-in. slots about 6 in. apart, and was made in halves to be drawn together by bolts. When fitted over the joint, the straps acted as a jig, and the joint could readily be tack welded through the slots. This was done, in increments 4 to 5 in. long, completely around the tank, before the straps were removed. Then, rotating the tank on rollers for downhand welding, the finish weld was made with one pass on the outside, using a weaving technique to create a slight reinforcement, and a finish bead on the inside. A current between 260 and 300 amp. was used, with a 3/16-in. tungsten electrode and superimposed high-frequency. Argon consumption, because of outdoor operation, was unusually high, but not unreasonable at around 25 liters per min. The entire job of assembly and welding was completed in about 15 hr., and the resulting repair was practically as good as new.

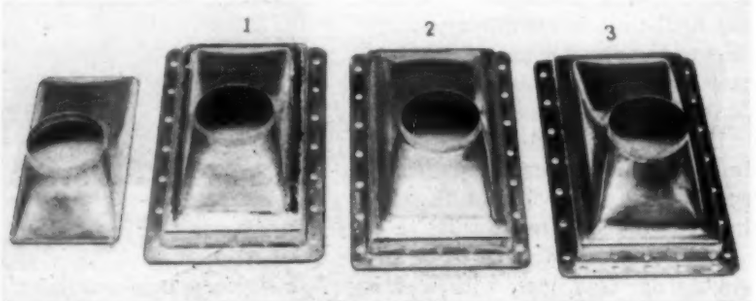
Even if such jobs did not require filler metal, their physical size or weld locations would probably require manual welding. Mechanization of the operation is practical, however, when the part is such that it can be located, and moved, conveniently in relation to the arc, or when the arc can readily be moved along the joint, by some sort of travel mechanism. Such welds as circular girth or head seams, straight line joints, simple arcs and curves, can be readily set up for machine welding. The results are usually a smaller, more even, smoother bead than in manual work, and appreciably higher speeds. The latter, however, will not be economical if setup time plus welding time exceeds the time for manual work, as it might in a short weld. Largely, the applications of machine welding follow the same general pattern as those for machine work with any other welding process. Quality production of a long seam will usually indicate a job for machine equipment, as will quantity production of shorter joints which can be readily positioned and handled.

Rolling Mill Application

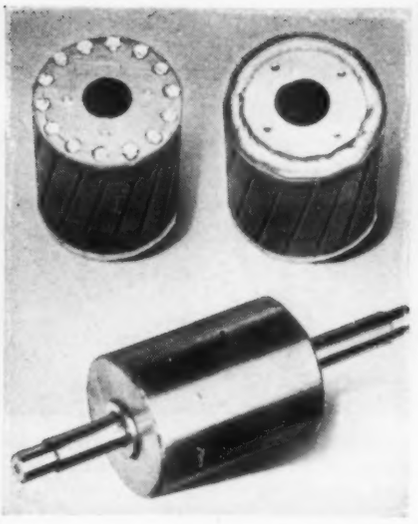
An advantage of machine welding is that it is readily integrated with other cyclic operations. One such use is in certain nonferrous rolling mills. The length of strip of sheet which such mills can produce has been limited by the size of the ingot, and it is often desirable to obtain greater continuous lengths than the limitations permit. By joining partly rolled sections end-to-end between stages of rolling, with machine welding, the dimensional limits can be overcome. The weld is free of flux, slag, or inclusion, metallurgically sound, and upon rolling develops all the physical characteristics of the base metal, since there is no dilution or change in the

Multi-joint assembly of aluminum tubing and channel (left) welded by the inert-gas-shielded arc to close tolerances for squareness and dimension. Absence of flux eliminates danger of interior corrosion (photo courtesy Production Engineers & Welders Co.)

Stamped aluminum cover-pan assembly . . Section at left below is joined to flange base by fillet weld (1), ground (2), and polished (3) to form an almost invisible joint



New bottom fitted to aluminum tank. Strap serves as a jig, with slots permitting tack welding in 4- to 5-in. increments, after which strap is removed and joint finish welded by downhand welding as tank is rotated on suitable rollers



Irregular contour of mechanically assembled rotors, left, is changed to the smoothly rippled bead, right, by inert-gas-shielded welding. After machining and mounting on shafts, center, no trace of the mechanical joining, or of the weld, remains

analysis at the weld. This technique has been applied to brass and copper work, within the limitations of the alloys, with good results, and with considerable benefit to the users. Welds are made with dc, straight polarity, and helium, with current values, flows, and electrode sizes dependent upon the thickness of the material.

Electric Motors

In a different type of application, this process has taken care of one of those special problems which are always cropping up in modern production. The job is that of fusing together the ends of copper bars and copper end plates in a laminated squirrel-cage rotor for induction motors. The rotor is built up of a series of thin steel plates, with heavier copper plates on either end. Through the whole assembly are passed numerous copper bars, and while the unit is under pressure, the ends of these bars are clinched mechanically. To obtain full electrical and mechanical function, it is necessary to fuse, or weld, the bar ends to the end plates. Several fabricators have done the job with inert-gas-shielded welding, and one ingenious installation is at the Long Island City plant of Salkover Metal Processing Corp.

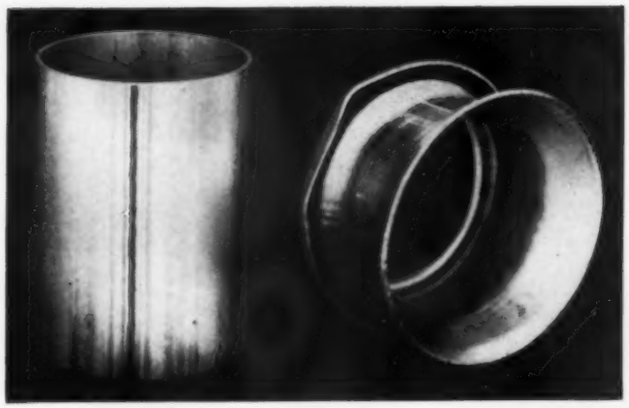
Several features of the job required working out. One was the irregularity of the area to be welded—the clinched ends of the bars are neither uniform in contour nor evenly formed in relation to the circumference of the end plates. Heat conductivity characteristics of the copper were definitely unfavorable. Finally, since the parts in production are for precision-type motors, the bead contour must be very carefully controlled, and the weld must be of flawless quality.

The setup used for the job consisted of a machine unit mounted on a fixed bracket, with lateral and vertical rack adjustments; a powered spindle to turn the parts beneath the arc; and a small, firebrick, gas preheat oven to soak the parts prior to welding. Using these three operating units, and skillful operation, three revolutions of the rotor under the arc at 150 amp. dc straight polarity on a ⅛-in. tungsten electrode with helium at 7 liters per min. produced a smooth, even, only slightly rippled bead. When the rotor ends are finish machined, flush and square, no trace of the original structure is visible. Bars and end plates have become one piece of metal.

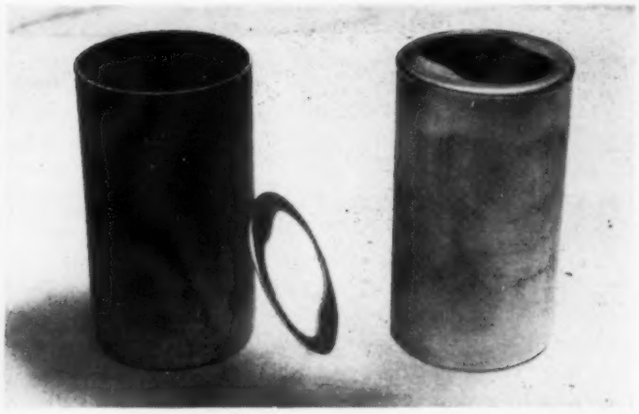
A further feature is the remarkable consistency and economy of the results. Out of many thousands of identical pieces, only two or three dozen rejects occurred, yet the operation was paced to yield better than one finished job per minute, welded on both ends. Timing was worked out so the next part to be welded is preheated just enough during the weld cycle of its predecessor. Gas consumption is so precisely regulated that the extremely low reject rate, less than 0.04%, is achieved at over 900 parts per cylinder of helium.

Special-Alloy Tubing

One of the uses of automatic heads has been in the manufacture of stainless, Inconel, and other special-alloy tubing. In this field it has practically replaced the atomic hydrogen process which was previously dominant, on the basis of almost doubled operating speeds and improved quality. The speeds are obtained as a result of the intensely concentrated heat, and are further increased by the use of an oxyacetylene preheating flame just ahead of the welding point. (Choice of fuel gas here depends upon the carbon pick-up tendencies of the material.) This preheat also helps in eliminating porosity in some alloys, such as Monel, which are subject to dis-



Stainless steel tubing specimens. Left, as welded, and right, after deformation testing to demonstrate ductility and toughness of the joint. No sign of failure is evident



Formed shell and stamped disk of stainless steel welded together on automatic equipment with a simple rotary jig. Bead is flat and smooth, and operation is extremely fast

solved or entrapped gas porosity, and on some alloy steels.

Stainless Tube Welding

One important quality factor in using the automatic head on tubing, particularly stainless tubing, is the even, predictable penetration obtained from the constant, automatically self-adjusting, arc length. Since about 90% of stainless tubing is re-drawn after welding, and the inner bead must be uniform and of specific size for satisfactory working, this factor is of considerable value. The shape and contour of the bead as a whole is further controllable by use of a low-pressure gas shield inside the tube—hydrogen, nitrogen and helium have all been successfully used for this—which, while preventing oxidation inside the weld, also can be pressure-controlled to adjust the weld contour for drop-through, flatness, or surface convexity, thus acting much as a solid metal backing strip does in jigged work.

The range of stainless tubing produced by one established user of the automatic process runs from ⅜ to 6 in. in diameter, with wall thicknesses from 0.032 to 0.165 in., and at production speeds as high as 10 fpm. Typical welding procedures for tubing of 0.032-in. wall are about 175 amp. dc straight polarity, 18 cu.ft. per hr. of helium, and a speed of 10 fpm. With flame preheating, these speeds can be increased by as much as 25%.

In many cases, the automatic arc adjustment of this equipment is valuable for mass production of units which do not adapt themselves to precision jigging, or which do not warrant production of suitable jigs. Thus, a small circular container can be positioned in the simplest kind of device, welded with consistent penetration even if it is somewhat off center, and results will be entirely satisfactory although the time and expense of exact jigging are eliminated. In effect, this type of setup produces a welding tool of remarkable versatility, for production can be readily changed from one diameter or shape of unit to another, as long as the positioning fixture is provided with sufficient capacity and the parts are of similar contour, without any important change in the welding arrangement. In this way, quantity production of small units requiring high strength, quality, and finish is achieved rapidly at low cost.

One of the major uses of the automatic process is in sanitary and food-processing equipment, which often requires shapes and contours varying from circles and straight lines admirably suited to the capabilities of the automatic head. Long curved seams, round corners, elliptical girth welds, etc., are common in such production, and manufacturers in several lines have found this welding technique of real value, not only in speed and efficiency, but also in the remarkable smoothness and high quality of the resulting bead.

Conclusion

THE potentialties of automatic equipment point the way to one of the important fields of development for the process. As it becomes more and more a mass-production tool, unit costs will shrink more and more rapidly, until the time may come when its facility and high quality will be used on far cheaper materials than are considered suitable for it today. On the other hand, its availability as a rapid, low-cost high-quality process is likely to spur the trend toward use of stainless, aluminum, and other quality materials, making their special advantages available for many products which today do not warrant the highter material and/or processing costs they now impose.

Users already include a wide range of types and sizes of shop, industry, and work, welding a great variety of products, joints, and materials. The constant factor in every job is the attainment of high-quality welds on hard-to-weld work.

The combination of process versatility and reliability, along with increasing use of the materials best suited to the process, has been an important factor in its rapid expansion. With increased knowledge and a greater wealth of reliable data, the process is rapidly becoming as routinely established as any other. Those who have used it have learned already that, while not a universal cure-all, it is the ideal answer to a host of welding problems. Those who will adopt it in the future will very likely find it more than the answer to welding problems, for it has every prospect of opening up wide new fields for welding as a production tool.

TALKING SHOP

Glass Lube

GLENN L. MARTIN has substituted a 0.027-in. glass blanket for graphite or grease on the stretch block in stretch-pressing magnesium-alloy sheet. Spun glass thus woven has high heat resistance and tensile strength, presents a hard, smooth surface that provides good sliding surface and cuts heat transfer from piece to block. In one case, forming time was cut from 70 sec. with graphite to 5 sec. with the glass blanket.

Half-Moon Carbide

ADVANTAGES of carbides are not overlooked in the Hunter Spring Company. On spring-winding machines for the heavier-gage wire, carbide inserts are used on the cut-off blade, on the half-moon arbor about which wire is coiled, and on the coiling point to extend service life.

Plastic Jigs

LAMINATED PLASTIC shells have been used for more than a year by one aircraft company to form the locating portions of assembly jigs. Rayon or glass cloth is laminated over a wood or plaster mockup, with air-setting resin as the binder. Finished shell is an accurate replica, has high strength and distortion resistance and is easily handled. Costs and time are cut.

Titanium

NAMED after the queen of the fairies —and about as difficult to get out of the earth—titanium has long had commercial possibilities. Now du Pont is beginning small-scale extraction. The metal is silver-white, comparable to stainless steel in strength and corrosion resistance, but weighs only a little over half as much. Thus it is less than twice as heavy as aluminum, but several times as strong. It is the seventh most common metal in occurrence—a hundred times as plentiful as zinc, copper or lead, but tough to separate from its ores. This has limited its use to paint pigments, but sponge and bar (up to 100 lb.) forms will soon be available. Sponge will cost $5 per lb.; ingot prices are not yet set.

Pure titanium melts at 3150 F., boils at 9210. Yield strength annealed is 70,000 psi., which rises to 100,000 psi. with cold working. Ultimate tensile is about 10,000 psi. higher in both cases. Density is 4.5, atomic weight 47.9.

Cleaning Hints

FRIEND OF OURS, quite a fisherman, got a small bottle of silicone oil to coat fishing flies. Knowing all the stories about how unaffected it is by heat and solvents, he was properly distressed when he spotted his best sport slacks with the stuff. We checked with G. E. for him. In case you spill some. use any good solvent cleaner, like Carbona. Or the dry cleaner can take 'em out, says G. E.

P.S. Turned out the spots in this case were something else, because plain water cleaned 'em.

V-2 Design Changes

DEVELOPMENT of the German V-2 rocket took 18,000 man-years, according to Dr. C. F. Green of G. E. Private inventors began rocket development in Germany in 1929-30; the government took over in 1933. Peenemunde was set up in 1937-38, at a cost of 300 million marks. Work on the V-2 began about 1940; the first one was fired July 6, 1942, but the first distance flight was not made until October, and the first real combat use was late in 1944. Engineers were forced to make 65,000 design changes in the V-2 after the first one had flown successfully. But in the last six months of the war, the Nazis fired 3,165 and were making V-2's at 96 a day.

Daffynitions

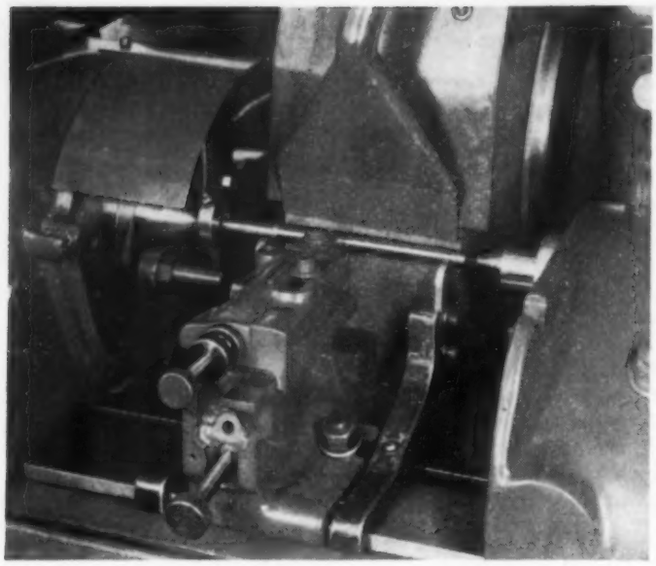
MODEST MAN: A fellow who says he thinks he's only half as good as he really is . . . Opportunity: Something a fool waits for while the wise guy runs down the road to meet it . . . HICK TOWN: One in which there is no place to go where you shouldn't . . . CHIVALRY: A man's inclination to defend a woman against every man but himself . . . GENTLEMAN: A patient wolf . . . CHIROPRACTOR: One who gets paid for what other men get slapped for . . . NATURALIST: A guy who always throws sevens.

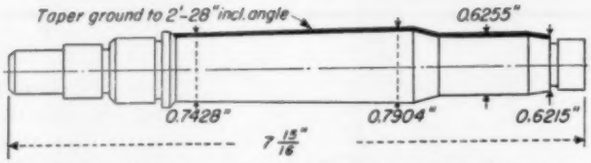
Air vs. Liquid

THE PERENNIAL ARGUMENT about air vs. liquid cooling is back again with Continental's announcement of an aircooled engine. The block has either horizontally opposed 4⅝-in. diameter or V 5¾-in. cylinder arrangement, simply adds more cylinders to increase power. The small-bore blocks provide 125 with 4 cyl., 250 with eight. The large-bore blocks cover 375 hp. with 6 cyl., up to 1040 hp. with 12. To cut costs, parts are interchangeable except for blocks, crankshafts, camshafts, con rods and bearings.

Air cooling gives an 8-cyl., 250-hp. engine that weighs 777 lb., against 2,400 lb. for liquid cooling, including water pump and radiator. Space is a third or less; spare parts are fewer and less specialized.

· TALENTED TOOLING

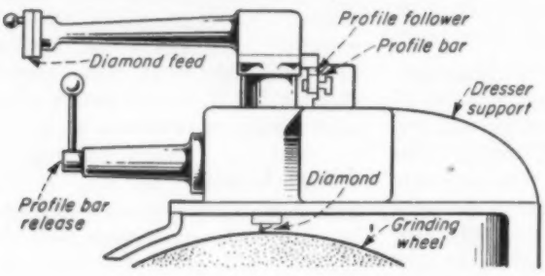


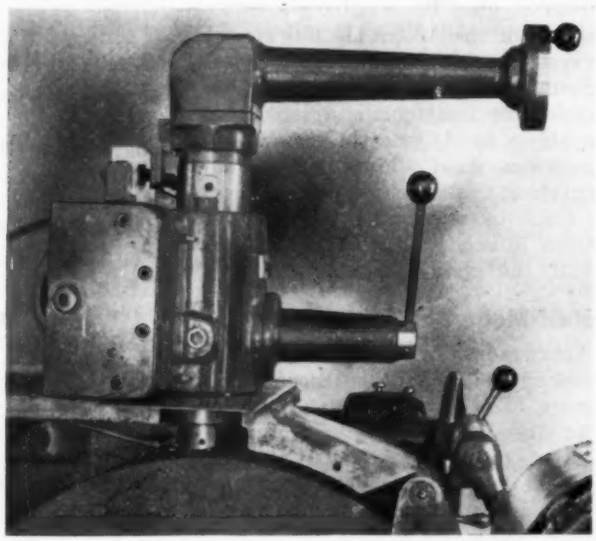


Armature shaft is form-ground on three diameters, two tapers and a radius. The profile (heavy line) is dressed on 30-in. wheel and reproduced on workpiece

Plunge grinder (at left) finishes shaft with rapid infeed, slow grinding feed, spark-out period, footstock release, and automatic wheel-dressing operation. Work is loaded on two cradles and supported by Carboloy center tips and back-rest jaws. Footstock control is from a foot treadle in front of machine

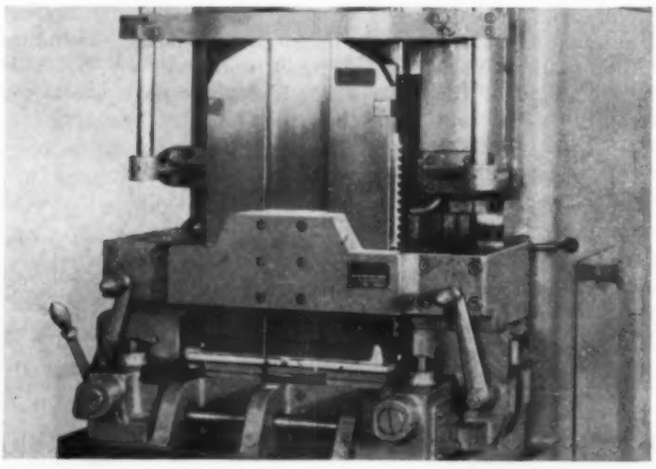
HYDRAULIC CONTROL OPERATES DIAMOND GRINDER DRESSER



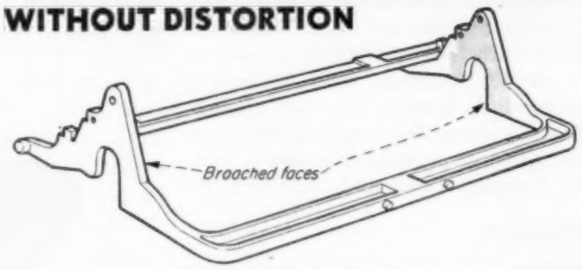


Diamond traverse for dressing operation is hydraulically controlled. Reverse in motion from left to right is automatic and diamond travel speed is varied by a throttle valve. Lever disengages profile follower from profile bar and handwheel adjusts depth of grinding cut

Replaceable profile bar (right) behind feed arm is bolted to a T-slot on mechanism. Diamond is forced against wheel by springs inside spindle and is cooled by fluid through plastic tube under wheel guard. *Landis Tool Co.*



BROACHER MACHINES LIGHT FRAMES WITHOUT DISTORTION



Typewriter-carriage frames are broached on their inside faces on a 36-in. 6-ton pull-down machine. The aluminum pieces are clamped from both sides for a semi-automatic stroke. Positioning is upside down under a recessed broach-holder guide. Machining speed of the broaching inserts is 30 fpm. *Colonial Broach Co.*

ROUND TABLE

Rest for the Weary?

"Had quite a confab with Harrison a little while ago, Ed," said Al as he dropped into Ed's extra chair. "He seemed to think that we should do away with stools at the lathes."

"Well, he finally caught up with you, eh?" laughed Ed as he tipped back comfortably against the wall. "I noticed him looking around the other day. He was brewing a storm on his weary pan."

"What's wrong with a stool at a lathe?" replied Al indignantly. "You've used one in your time, and so have I. Of course I had a cut on when I sat down."

"A lathe's different than most other machines, Al. It's decidedly a standing-up job, whereas working at a bench is another story."

"I suppose you'd have a man run a drillpress standing up."

"No, Al, I wouldn't. A stool is necessary on that kind of machine."

"Well look, Ed. I can't see a thing wrong with a man sitting down at his lathe when his machine is working. Give me a good reason why that's wrong."

"I can't just put my finger on the reason, Al, but it seems to me that a man turns out work more efficiently on his feet. It just doesn't seem natural otherwise."

"Horsefeathers!" countered Al. "I seen fellows taking it easy by leaning over the tailstock—they could just as well be sitting. And it would be a lot healthier on the back, too. As far as I'm concerned, a man can stand on his head, as long as he produces."

"Bah!" exploded Ed. "Look here; I'll lay you three to one that you won't get more than two objections if you remove all the stools right now. I wouldn't be surprised if half of the men approved right away. You don't see Nelson using a stool! He's got no time for such refinements when he's working to get a job out."

"That's not the point, Ed. The question is: Why should there be any objections to the use of stools at the lathes? You haven't answered my question."

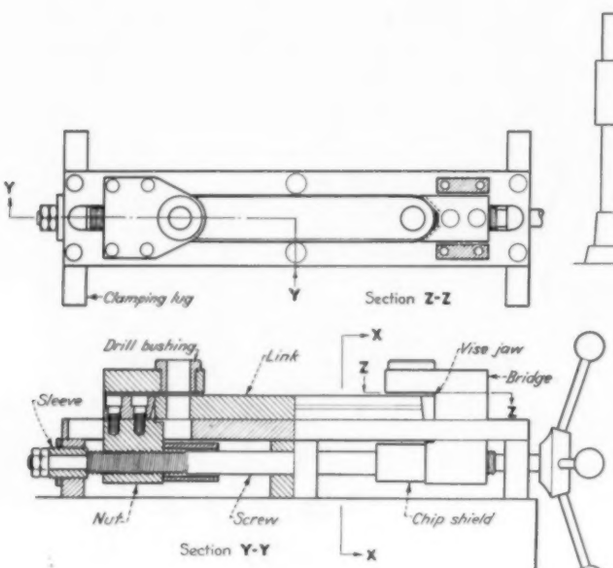
"All right. Let's lay it out in the open and see what the men have to say about it."

"I'll do that, Ed. And I'm sure they will want to keep them."

"Want to make a little bet before you take it up with them?"

***DOES A PLACE** to sit down invite relaxing—or does it relieve unnecessary fatigue? Most machine tools were once served by "standees"; most are now served by operators who are seated. What are your ideas and opinions? Discussions of earlier topics appear on later pages.*

Practical Ideas



Double-Acting Screw on Vise Fixture Centers Forged Links for Drilling

SEVERAL HUNDRED forged-steel links had to be drilled with 1-in. holes at each end. Since the holes were to be 10 in. apart and centered on the links, a vise fixture was made to compensate for slight variations in the lengths of the links.

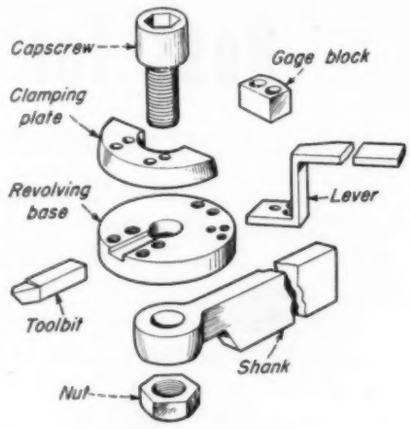
Faces of the vise jaws were inclined in two ways: to the bottom in a vertical cross-section to hold on the forge-drafted link ends, and to the centers of the jaws, horizontally, to hold the rounds on the ends. Each jaw was secured by a tongue through a slot in the table to a nut under the vise. These engaged a single, handwheel-operated screw that was threaded right-hand at one end and left-hand at the other. This action worked on the oppositely threaded nuts to draw both jaws to the center of the vise. The screw was held to one end of the fixture by a sleeve and nuts.

Two drill bushings were bridged over the vise jaws and were permanently located 10 in. apart, equidistant from the center of the vise. This allowed the operator to load and unload by pushing a new piece in from the front, which dropped the old one out the back. Small collars were added to the nuts under the tables to protect the screw from chips. The radial drill on which the work was done was locked radially and two stops were located to position the head over the two bushings. The fixture was clamped to the machine table with the handwheel overhanging the edge. *Clifford T. Bower, Decatur Ga.*

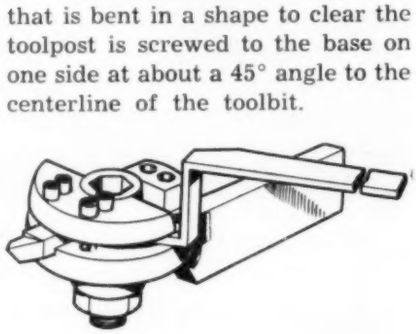
Radius-Cutting Lathe Tool Mounted in Toolpost

TOOLS for turning spherical sections get better and better. This one has two distinct advantages over older types. It can be set up in a toolpost and can therefore be located by conventional means, and it can be set accurately for a given radius by a gage block mounted on the tool.

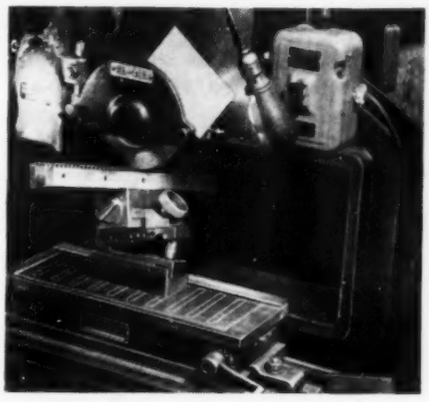
The solid shank supports a rotatable baseplate which carries the tool. The base is cut out on its upper face so the shallow slot will position the toolbit. Four small



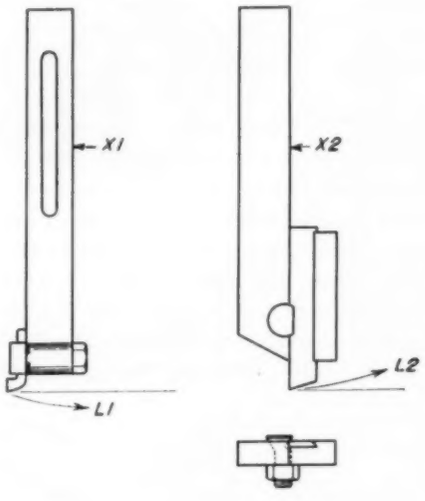
socket-head setscrews hold the clamping plate, which is only a half-circle, on top of the bit and fast to the base. A rotating lever that is bent in a shape to clear the toolpost is screwed to the base on one side at about a 45° angle to the centerline of the toolbit.



Clamping is done with a large socket-head capscrew, the head of which rests on the base and clears the clamping plate. After alignment of the tool has been made, this is clamped nearly snug to retain the tool in the slot in the base. The distance from the back of the gage block to the tip of the tool is finally set at the required radius plus the distance from the toolholder center to the back of the gage block. *Allan B. Nixon, Springfield, Mass.*



Sharpening broach sections for vertical broaching machines has been simplified by mounting a special split-spindle column at the rear of a No. 2 Brown & Sharpe surface grinder. Prior to making this change, long broach sections interfered with the standard spindle column, making it necessary in many cases to reset the job three or four times in order to complete a sharpening operation. The new column usually permits the resharpening of broaches in one setup. *A. S. Nippes, Elliott Co., Jeannette, Pa.*

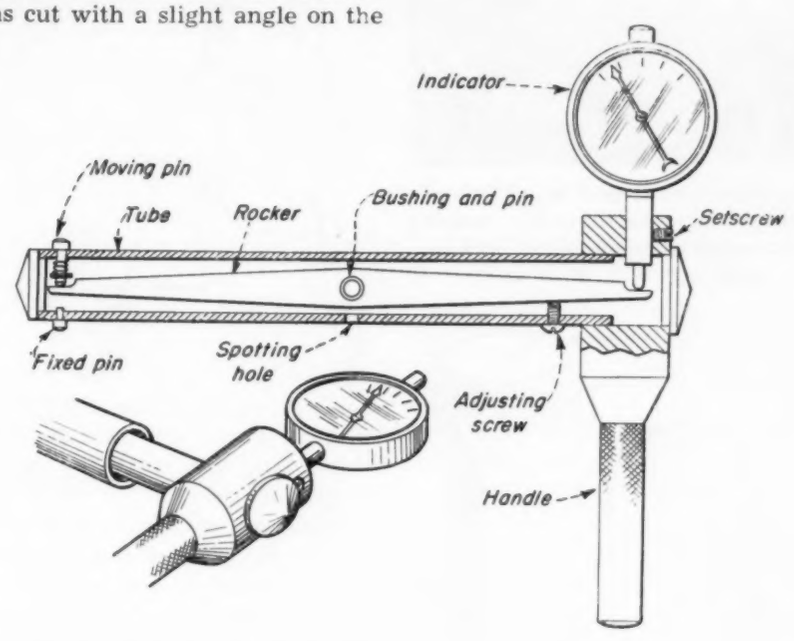


Toolholder Tackles Heavy Cuts

SHAPER TOOLS dig into the work on heavy cuts unless the mounting is exceptionally rigid. This tendency can be eliminated by installing a different type of toolholder and tool. This one I developed stops chatter and does not permit removing more material than that for which the tool is originally set.

A standard type of holder, shown at the left, is pushed back under heavy load along path L1. Since pivot point X1 is behind the point of the tool, this path digs into the work. The other holder, however, holds the tool so it follows path L2. The tip of the tool is either directly below or slightly behind the pivot point X2, so the path leads back and away from the work.

The holder was made from a ⅝-in. mild-steel bar. The toolslot was cut with a slight angle on the back face that aligned side clearance of the tool equally on both sides. The tool is clamped with a cut-away conical-head bolt tightened by a nut on the back of the holder. A slight angle on the lower edge of the slot grips the bottom of the tool. *George W. Wilson, Mankato, Minn.*



Rocker Arm Actuates Bore Checker

WE RECENTLY needed an inexpensive gage to check ⅝-in. bores, 8 in. long, to a one-thousandth tolerance. The one we developed did the job perfectly.

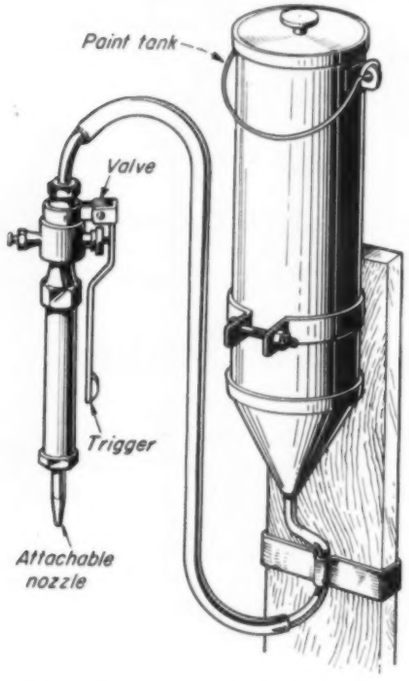
The outer shell was a piece of tubing with a 9/16-in. O.D. and a ⅜-in. I.D., 6½ in. long. Two bushings were pressed into holes drilled through the tubing at the center and were reamed to ⅛ in. after assembly. The rocker was turned from 3/16-in. drill rod, and flats were milled at each end to the centerline to seat the moving pin and the indicator spindle. A hole drilled in the center of the rocker was spotted through a vertical hole drilled in the tubing. This was a slip fit for the ⅛-in. pivot pin. The hole was also counterbored to take the bushing from both ends to a slight depth.

The fixed pin at the end of the gage was pressed into its hole, but the moving pin slipped. It was held by a spring and split clip that fastened in a groove turned on the pin's shank. Both pins were hardened.

Near the handle a small pin was screwed into a hole in the tube to limit motion of the rocker. The handle was turned and drilled from solid stock with a hole for a setscrew to clamp the indicator shank. Plugs were added to the ends of the gage to keep out dirt. When the gage was calibrated, a small spring was placed under the indicator cap to provide compression against the end of the rocker, which balanced the spring at the moving pin. This counter-balancing leveled the rocker.

Since the rocker was pivoted at its center, variations in the bore being checked were read directly on the indicator. *Jay M. Clark, Rushville, N. Y.*

Chevrolet hoods and trunk lids are finish-painted by operator holding paint receptacle and nozzle. Rack supports rigs with other colors

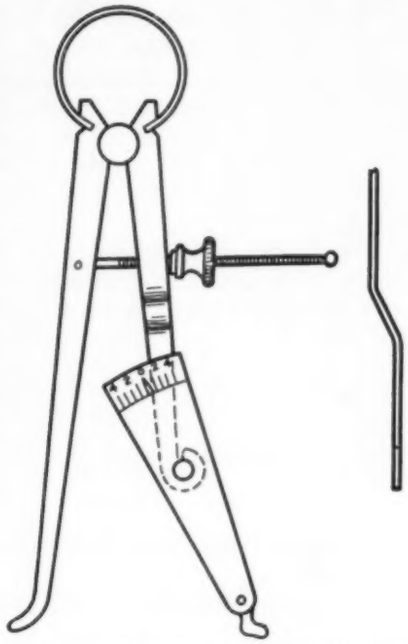


Gravity flow from tank builds up pressure ahead of trigger-operated nozzle. Operator can release the required quantity at an adjustable rate of flow. *Chester S. Ricker, Grosse Point, Mich.*

Caliper Leg Mounts Indicator

INSIDE CALIPERS can be adapted to give more accurate diameter readings if a small test indicator is mounted on one leg as illustrated. The idea occurred to me after I broke one leg off a 6-in. calipers.

The broken leg was bent around



to form an eye for the indicator bolt. I then offset the indicator leg so that it and the good leg were in line and met when the calipers were closed.

Readings of inside dimensions are closer because measuring the calipers with a micrometer now depends not on feel but on visual accuracy. *W. A. Dice, Miami, Fla.*

Block Clamps Boring Bar

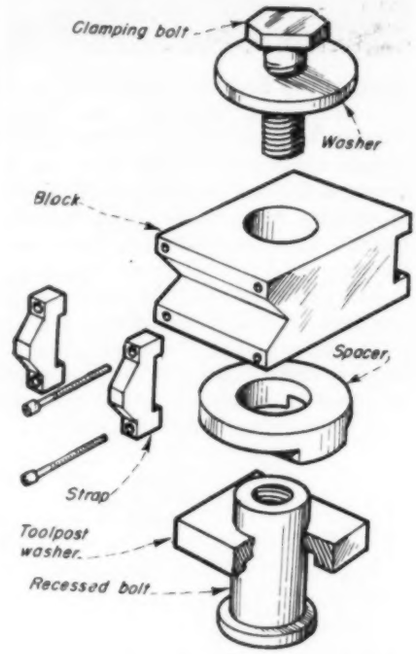
ALL SIZES of boring bars can be handled by this holder without adapters, and it will maintain the bar centerline coincident with the centerline of the lathe spindle. A lathe with a short distance from the top of the compound to the spindle centerline should be chosen for installation.

The assembly is made up of a block, straps, clamping bolts and washers. The block is V-slotted in one face to mate the straps, which are formed as illustrated. The other side of the block is slotted to take a standard lathe toolholder in conjunction with the straps. In this respect, the holder can substitute for the regular tool post.

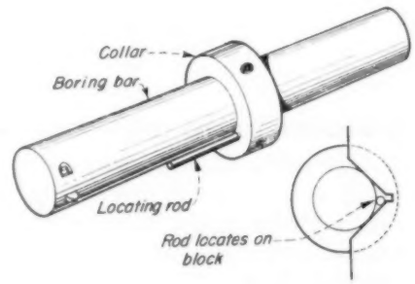
A recessed bolt is the spindle of the holder, and this is covered at its base by a tool-post washer that is recessed in its lower face to fit over the shoulder on the tool-post washer.

Large bars are held with the holder assembled as shown. Smaller bars can be held if the straps are reversed and the small flats are clamped against the bar in the V slot of the block.

Double threading can be done easily if the V is cut at 90°. A collar is attached to the bar, as illustrated, to ease locating. A small



rod is inserted in the collar to act as a positioner. The first thread is run with the rod located against the edge of the V, and then a gage block is mounted between the face of the collar and the block to shift



the tool one pitch along the thread. This can also be done for triple threading. Locating the toolbit in the same relation to the work is done by fixing the locating rod against the same face of the V as before. *Ray Cafiero, Brooklyn, N. Y.*

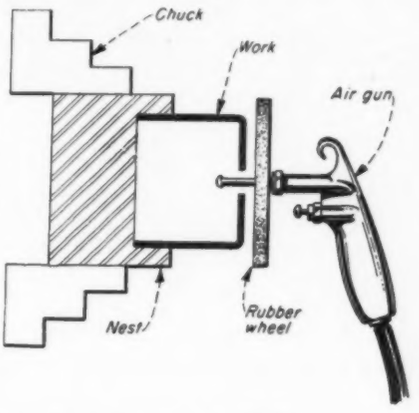
Center Set Equips Standard Lathe

TAILSTOCK CENTERS are often the most abused tools in a machine shop. Since the accuracy of a cut depends just as much on the center as on the chuck, collet or spindle, a set of good centers of the proper size for the lathe is important. These five dead-center pieces are an example of the sets I have used for many years.

The first is a common center for large and meduim work. The second, a half-center, is employed on setups that require facing off the end of the stock. The third is good for small work, such as chasing threads on shaft ends. It leaves room for starting the tool.

Number 4 is medium-length center useful for large or meduim work that requires clearance between the work and tailstock, and the last is extra long for setups on the faceplate.

Nowadays centers with ball bearings are becoming popular, and these have their uses, but most ordinary jobs will be handled with one of the set illustrated. *Charles Homewood, Hollywood, Cal.*

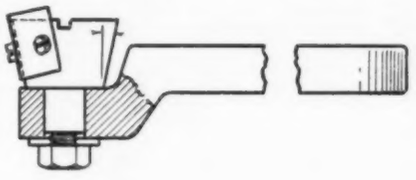


Air Gun Ejects Thin Shells

A SHOP FULL of air lines sometimes misses a good opportunity to use air pressure on special jobs. We had trouble ejecting thin-walled aluminum parts from a nest chucked in an engine lathe until we thought of employing an air gun to force the light shells out.

The workpieces had been set up with pin ejectors, but they became distorted often and the pin system was quite slow. Applying an air gun to the small opening did little good because the air escaped past the nozzle until we forced a sponge-rubber disk over the nozzle.

We now eject the parts by placthe gun close to the part and pressing the disk against it. A small squirt of air builds up the inside pressure enough to release the part. This is not only easier than other methods, but production has increased 25% because of the idea. *Charles Schwartz, Brooklyn, N. Y.*

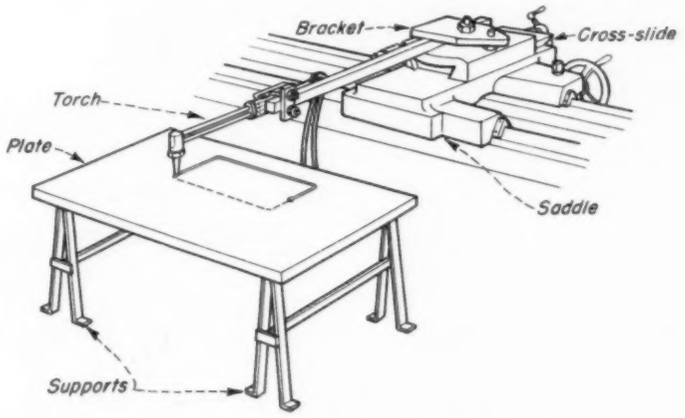


Razor-Blade Tool Finishes Lead

LEAD SHEATHING SAMPLES, taken from electrical-transmission lines, were to be faced off smoothly for etching purposes, but our ordinary tools did not produce a fine finish. To prepare the ends for microscopic examination, we made a toolholder that used a razor-blade tool.

The conical-frustrum holder was turned at about 12° to provide a clearance angle. The top diameter was 1⅛ in. Assembly was done with a nut and washer on the threaded shank, and it was mounted on an offset bar. The bar was mounted in a standard lathe toolpost on an engine lathe.

The finish produced with several 0.00005-in. cuts at a 25 fpm. surface speed required no further laboratory treatment except etching. When the blade dulled, it was moved around the holder and clamped by the small screws in a different spot. *G. R. Milner, Gainsborough, England.*



Lathe Mount Drives Gas Torch

TORCH-CUTTING rectangular shapes from sheet and plate can be a simple and accurate process if a setup is made to drive the torch through the feed of a lathe. This allows us to cut straight lines really straight.

The torch can be attached to the lathe compound by a clamping device that extends it out the back of the lathe. Automatic feed can be employed on long cuts — by aligning the work — and hand manipulation can move the cross-slide in and out for irregularities. *Paul Redl, Buenos Aires, Argentina.*

$25 In addition to regular payment

for the best

PRACTICAL IDEA

An extra payment of $25 will be made for the best Practical Idea in each number of *American Machinist*. To avoid bias, the selection will be made by readers, a different group each time.

PAYMENT—$25 in addition to regular rates for the item as published, to be paid as soon as reader votes are received—usually three to four weeks after the date of the issue. The winner will also be announced in these pages as soon thereafter as practicable.

JUDGES — A group of 200 *American Machinist* readers is asked to select preferred articles in each issue. The group is a true cross-section of all readers, and changes entirely each time. Their votes, in addition to guiding the editors, select the best Practical Idea. If at any time their votes result in tie, $25 will be paid to each and every co-winner. Decision of the readers will be final in each case.

REQUIREMENTS — Only items in the Practical Ideas pages are eligible, and they must be submitted directly by the originator. Do not worry about your shortcomings as a draftsman, photographer or author—every item will be edited in accordance with *American Machinist* standards and suitable illustrative or explanatory material added where needed. Readers will judge only the finished product—in terms of its usefulness to them.

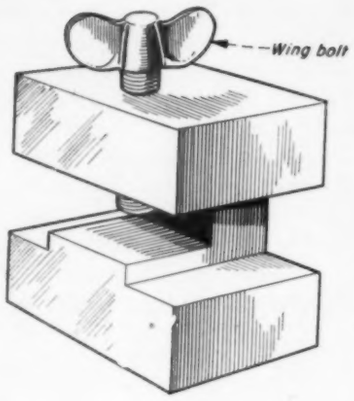
WHO MAY ENTER — Anyone may enter except employees of the McGraw-Hill Publishing Co., Inc., and those of advertising agencies or departments. Suggest to your employees that they submit ideas.

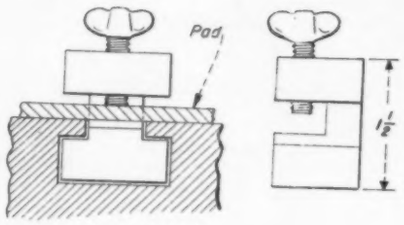
HOW TO ENTER — Send your entry to "Practical Ideas Editor," American Machinist, 330 West 42d St., New York 18, N. Y.

63RD WINNER:

Joseph Budnick

Delayed-Action Die

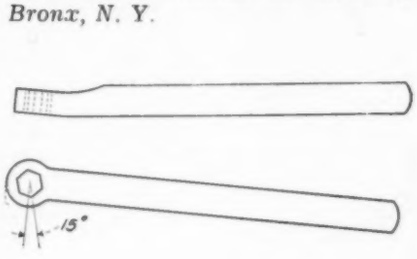




Wing Bolt Clamps Drill Pad

PADDING PLATES to prevent drill breakage and table scoring on drill-presses can be clamped down by wing-bolt clamps like the illustrated one.

The clamps were orignally designed for this purpose only, but we have since made larger sizes to hold down jigs and fixtures. Milling setups can also be made with them. *Thomas M. Shortell, Bronx, N. Y.*



Socket Head Forms Box Wrench

BOX WRENCHES for hex-head screws can be made in a hurry from old socket-head setscrews and handles. A screw head that is deep-formed is chosen to give the thickest possible wrench section.

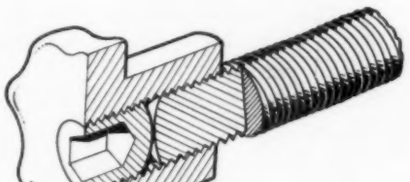
The screw head is brazed to a handle of any convenient size and shape, with the axis of the head offset about 5° from that of the handle. This makes getting at most bolt heads easier.

The blind end of the screw head is ground off after the brazing is completed. A wrench or key can be driven through the head with lapping compound to finish the gripping surfaces. Heat treatment that gives good results is to heat to a bright red and quench in oil. Sizes are limited only by the socket-head screws available. *Orion S. Wretley, Hamburg, Pa.*

Spatter Mix Nixes Scale

LARGE SHAFTS (48 in. long by 14 in. dia.) we produce are threaded at one end and fit into a box section at the other. We had trouble with scale formation during heat treatment on both the threads and the bearing end until we adopted a protective covering.

We spray the ends with a water-soluble weld spatter solution, heat treat, and then remove the solution by washing with plain water. The cost of application and materials is practically nil, and the protection solved our problem. *Francis Aimers, Cedar Rapids, Iowa.*



Stud and Setscrew Bind Inside Fixture Handle

GENERAL PRACTICE, when making drill jigs and milling fixtures, is to locate and attach a wheel, lever of a hand knob to a screw stud by drilling through both and pinning them together. A simpler way is to insert the stud in the knob collar and run a short setscrew of the same pitch and lead in from the other end, thus jamming the threads together.

Assembly is quicker, and the knob can still be removed and replaced. In addition, position adjustment is simple and fast. *Bernard D. Campbell, Endicott, N. Y.*

"Give us the tools..."

TO SURVIVE

America Must Have Better Tools

IN THE past twenty years the United States has failed to provide its workers with enough new tools and equipment.

To most Americans this statement will come as a shock—or will be doubted. We are quite complacent about our industrial equipment, for easily understood reasons.

Throughout the '30s we heard continuously the propaganda line that the United States had become a "mature economy." The job of equipping America with industrial plants and tools was said to be largely done.

Now, knowing that industry is spending billions to expand and rebuild its plants, many people assume that the result must be a first-class industrial system.

A further powerful inducement to complacency is the vastly *worse* industrial condition of most of the rest of the world. When Americans look abroad in almost any direction they see shattered plants and equipment. A natural reaction is that we are sitting pretty.

That is a dangerous reaction. Between depression and war, we have failed to build the tools and equipment we need. This condition is dangerous for three reasons:

1. *From bitter experience we know that national security depends first and foremost on the capacity and readiness of our industrial equipment.*

All of our plans for stabilizing prosperity assume a world at peace. The greatest menace to peace would be an unarmed America, unable or unwilling to keep herself strong and ready for defense—strong in spirit, in resources and in the all-important industrial plant and equipment.

2. *Whether Americans live well—or badly—depends directly on the kind and quality of tools used by American workmen.*

This is true for all workers, and for every worker—from a garage mechanic and his wrenches to a steel mill gang and its rolling equipment. In a monumental study of "America's Needs and Resources" the Twentieth Century Fund found this fact: The improvement in the real income of the American people has more consistently followed the amount of power used in industry than anything else. What the workman worked *with* determined, more than any other factor, the size of his pay envelope, and what it would buy.

3. *Our success in stabilizing prosperity will depend largely on what we do about building new tools and equipment.*

About 30% of our industrial workers are employed in producing tools and equipment. Steady employment for them is essential to our over-all prosperity.

How far have we fallen behind in providing new plants and equipment?

Estimates vary. Here is one rough estimate: If we had built new industrial facilities during 1930-48 at the rate we did in the prosperous '20s, we would have spent at least $100 billion more than actually we did.

To get a better and more complete measure of this deficit, McGraw-Hill is undertaking a survey of American Business' Needs for New Plant and Equipment.

Businessmen all over the nation are being asked to answer questions like this: How much

money would you need to put your plant in first class condition? How much are you planning to spend for new plant and equipment? Where do you expect to raise the money? The results will be reported later in this editorial series. Already the survey shows we have fallen many billions of dollars behind.

Some shortcomings are apparent to everyone. They are revealed in a lot of rickety transportation facilities and in rundown buildings.

Many other deficiencies do not come into general view. They are, for example, the antiquated machines in our plants. Of the privately-owned machine tools in use in 1945—when the last census of metalworking equipment was made by AMERICAN MACHINIST—54% were more than 10 years old. Their average age is higher today.

It is true that in recent years we have hit new highs in total national production. But we have done so by putting far more people to work than ever worked before . . . and by driving equipment to the limit of its waning endurance, sometimes beyond. It has not been done *primarily* in what is by all odds the best way to increase production—to use more and better and more modern tools and equipment.

Haven't we overcome much of this twenty-year deficit by rushing to build new plants since the end of the war?

No. For two clear-cut reasons:

1. The accumulated shortage is tremendous. The total of about $40 billion, which has been spent for industrial plant and equipment since VJ-Day, has not wiped it out.

2. Some key industries have had difficulty in getting the facilities they need. Take steel, for example—the industry that turns out our most basic industrial material. Its needs for new equipment are measured in billions of dollars. To pay for that equipment, it should have *risk capital*—money which people are willing to invest with a risk of losing for the sake of gain. For steel is an up-and-down industry. Earnings on its common stocks inevitably share both ways in those ups-and-downs.

Since the war, steel, in common with most of industry, has been unable to market new common stock successfully. Its outstanding stock is now selling for only about one-half the current net worth of the industry's present assets. With investors willing to pay only 50 cents on the dollar for its facilities, the industry can not readily sell stock to pay for *new* plant and equipment—at higher prices even than the old.

Why can't steel—and other industries—attract people who are willing to risk their money retooling America?

The full answer to that serious question must be left to future editorials in this series, for it involves many things . . . tax reform . . . mobilization of small savings . . . a new respect for corporate profits.

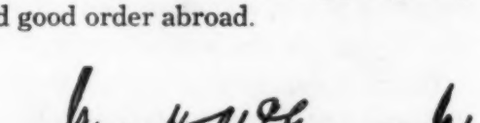
This first editorial seeks simply to emphasize two fundamentals:

First, our standard of living improves with the *quality* of our industrial equipment.

Second, American industry and American workmen badly need billions of dollars worth of better equipment *now.*

The American people must understand that *not only our continued prosperity but also our security as a nation depends upon giving American industry more and better equipment.*

"Give us the tools." This was Winston Churchill's cry for help to win the war. Only if we give American industry new and better tools will we have a chance to win abiding prosperity at home and good order abroad.



President, McGraw-Hill Publishing Company, Inc.

★ THIS EDITORIAL, and a series to follow, will be devoted to a single problem—how to provide American industry with the equipment needed to improve that envy of the world, the American standard of living. No more important problem confronts us today. Upon our wisdom in handling it depends not only the degree of our prosperity, but also our security as a nation.

NEWS OF METALWORKING

Seven Arsenals Step Up Output In New Program

WASHINGTON — The Army Ordnance Department's seven manufacturing arsenals are moving into a stepped-up production program. Increased activities include filling depleted ammunition categories, installing pilot assembly lines for items the arsenals have not made before and development work on new Ordnance materiel.

The reasons for the speed up are fairly obvious. The Greek and Turkish aid programs are calling for arms; increased activities of the National Guard and the reserve are bringing weapons out of mothballs and increasing repair jobs on weapons already out and several new weapons are going into production in arsenals for the first time.

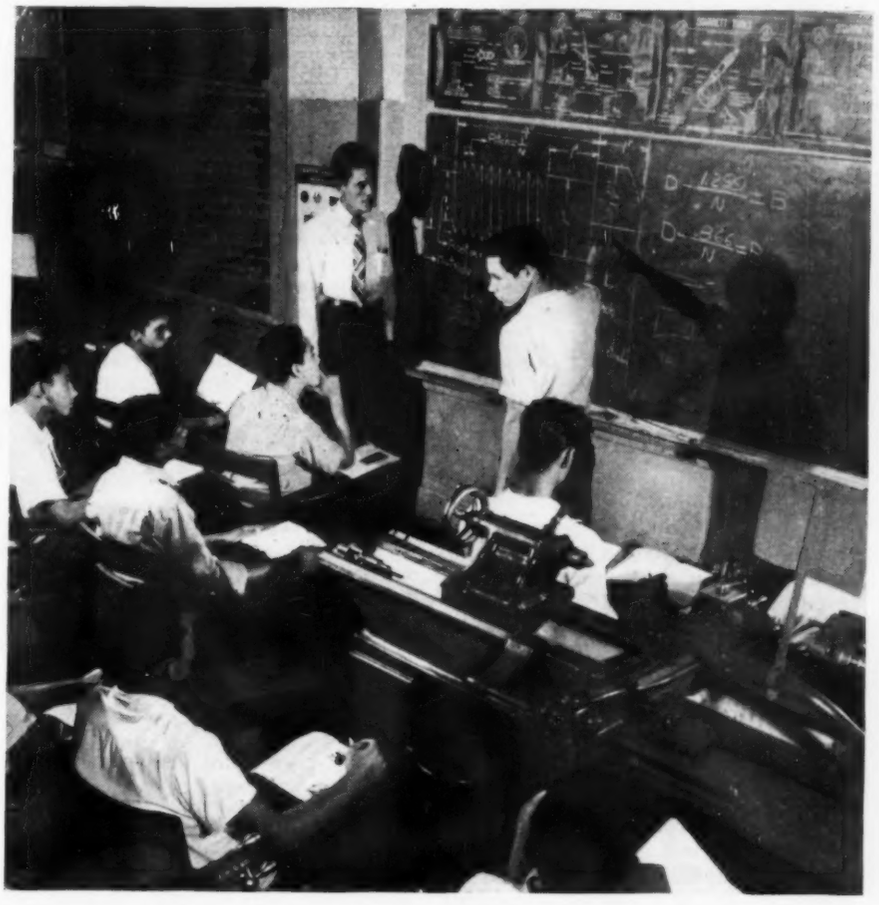
At Springfield, for instance, this small arms manufacturing center was almost idle from the end of the war until recently. Then it was handed the job of turning out the new and faster-firing M-3 .50-cal. machine gun for the Air Force. With the heavy increase in Air Force orders, the arsenal lost ground because of a shortage of training gunsmiths, and had to advertise for skilled workers. In addition, a pilot production line for the manufacture of .30-cal. carbines is being installed in the plant, and this takes skilled men.

Picatinny, the ammunition production center of the Ordnance network, is busy developing several new types of projectiles, is filling up the bins on explosives categories which had been slighted during the past several years, and has some rehabilitation work underway. One of the big jobs here is the construction of a pilot production line for manufacture of the new-type ammunition for the 57mm. and 75mm. recoil-less rifles.

Frankford arsenal is installing a pilot production line for small arms ammunition, and is also doing some rehabilitation work.

Detroit arsenal is starting the job of converting the M-26 tank into the new M-46 model.

Small arms production lines are being installed by Ordnance in the Remington and Winchester plants as standby units.



***YOUNG PUERTO RICANS** are trained in the San Juan Industrial School in all types of trades. Here is a group in the machinists class. The building and facilities are of the most modern class*

On the civilian side of the production picture, Ordnance is busy setting up production orders for several sizes of trucks, Continental engines, Allison "cross-drive" units for tanks, the new 3.5-inch "king-size" rocket launcher and two sizes of the recoil-less rifles and other equipment.

The impact of the military orders on the civilian economy will be slight—if it is felt at all. The numbers of items being ordered are small, although the aggregate adds up to a sizeable sum.

Western Firms Organize

LOS ANGELES—Western Manufacturers, Associated, composed of separate plants in 20 different subcontract manufacturing categories, has been formed here.

The current program provides sales representation for member plants, with offices of the association serving as a central clearing house to exchange information between members, and facilitate the interchange of work and opportunities. Personal contacts are made with industrial and trade development groups, Chambers of Commerce, trade associations and government procurement agencies, to strengthen business relations and uncover new work opportunities.

Martin Lovequist, head of Lovequist Engineering Co., is president; Norman Lynn, Lynn-Western, Inc., secretary, and W. R. Emmick of Walton Tool & Die Co., treasurer. Headquarters are at 1452 N. Seward Street, Los Angeles, Calif.

Lloyd D. McDonald

David Ayr

Richard E. LeBlond

Machine Tool Industry Vital, NMTBA WARNS

Six months would be required for the American machine tool industry to attain in a war emergency the rate of operations needed for prompt industrial mobilization.

Maintenance of a dynamic machine tool industry is of crucial importance to the American people as a nation.

Employers must establish and keep direct contacts with the thought leaders in their respective communities, because public relations, like charity, begins at home.

Our basic ERP policy should be reexamined to correct existing faults, such as ECA's refusal to influence local governments in their programs of rehabilitation.

These were some of the main points emphasized by speakers at the forty-seventh annual meeting of the National Machine Tool Builders' Association at the Chalfonte-Haddon Hall in Atlantic City Oct. 18-20. As usual, group meetings were one of the features of the program.

The luncheon honoring Senator Ralph E. Flanders of Vermont, former president of the Jones & Lamson Machine Co. and of the NMTBA, was a high spot. Senator Flanders was presented with a gift by the association in honor of his twenty-fifth anniversary as the NMTBA president and of his past 25 years of service to the machine tool industry.

Alexander G. Bryant, vice president Cleereman Machine Tool Co., the retiring president of the association, presided at all the sessions.

The fact that press manufacturers are being considered for admission to association membership was revealed at the meeting. A ballot will be sent out soon to members asking them to vote for or against this proposal. A number of press manufacturers have been members for a long time because of their production of machines other than presses which have met the association's definition of "a machine tool."

Five-Point Program

Mr. Bryant, in his presidential message, outlined a five-point program for the machine tool industry:

1. Continuance of research and engineering development to keep the supremacy of its products.

2. Assistance to the armed forces to maintain the nation's facilities for output of defense materiel in a condition of maximum usefulness and dependability.

3. Effective selling of "the world's best investment"—machine tools.

4. Enactment and enforcement of sound policies of taxation, repricing and amortization which will encourage business to expand and furnish more employment and produce more goods more economically.

5. Cooperation with such agencies as ECA, pointing out that ECA cannot function effectively unless supported by a foreign policy which will provide a degree of direction to the use of our loans and grants.

Outmoded Machines Cited

Though America has more than double the machine tools it possessed a decade ago, more than 90% of the machines now in use are in some degree outmoded. A 50% gain in efficiency in America's machine shops

Standards on Deferment of Apprentices Sought

Committee on apprentice training standards of National Machine Tool Builders' Association has recommended to board of directors that consideration be given to request for deferment from the draft of indentured apprentices who meet the following five requirements:

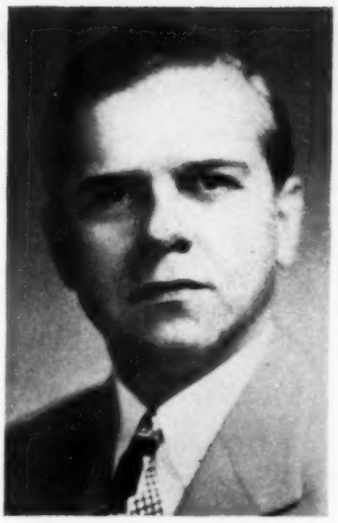
1. Employer must have graduated some indentured apprentices during previous two years.

2. Deferred apprentices must agree to complete their apprenticeship.

3. Apprentice must complete his course at least six months prior to his 25th birthday.

4. Apprentice must have served at least six months of apprenticeship before deferment is asked for.

5. Deferment to be limited to member shops, the apprenticeship programs of which conform to association standards.



Louis Polk

Ralph J. Kraut

Alfred V. Bodine

would be achieved by replacement of existing installations with present-day models. This fact carries great significance, said Mr. Bryant. For it is apparent that many of the political, sociological and financial ills of the world would be solved or vastly relieved by increased production. European recovery and American prosperity are indisputably interwoven and are dependent more upon increased production than any other factor.

Explaining why the machine tool industry could not get up to the desired rate of operations within less than six months in a war emergency, Mr. Bryant pointed out that builders have had to let their working forces dwindle, with no available reserves of skilled workmen at hand, and their supplies of steel, castings and other materials decrease onto a scanty basis. Engineering staffs have been cut because of drastically deflated order books.

Companies Injured

"The truth is," stressed Mr. Bryant, "that machine tool companies have suffered from the combined effects of taxation, renegotiation and absorption of post war markets by wartime production, just as the industry prophesied that it would."

Mr. Bryant attacked the federal government's outmoded amortization practices. Only the striking advantage of rates of saving as high as 50% and 100% on original investments have encouraged industry to buy machine tools in the face of the burdensome depreciation policy of the tax authorities.

Not many Americans realize that foreign governments participating in ERP are the real "directors" of that program rather tha Paul Hoffman, its administrator, according to M. A. Hollengreen, president Landis Tool Co. and chairman NMTBA committee on governmental relations, who recently returned from Europe. Mr. Hollengreen severely criticized ECA policies and described conditions in western European countries.

He declared that Italy has progressed further in rehabilitation than any other continental country. Fiat, for example, is exporting motors all over Europe. The Italian people are willing and eager to work. Sweden has a shortage of both dollars and sterling and will not be buying many U.S. machine tools.

French Cancel Orders

Switzerland is importing machine tools from the U.S. zone in Germany, from Italy and from Czechoslovakia. Belgium is now producing machine tools, including 50 engine lathes a month, and cannot be counted on for much importation of American machines. In France, orders for U.S. tools long on importers' books are being cancelled and the business placed in Britain.

Mr. Hollengreen said that "practically all Europeans I talked to could not understand why the American government was not indicating where and how ECA money should be spent." He emphasized that some clarification of foreign policy is essential to adjust the paradox in which American manufacturers refrain from shipping goods to eastern Europe, while nations to whom America is giving aid are transacting business within the Russia orbit.

The term "phantom orders" has given the false impression that machine tool builders are to produce machine tools against the possibility of war, stated Tell Berna, NMTBA general manager, in his annual report. The fact is that these orders are merely schedules of production to be filed until a war emergency arises. Then they will be activated by telegram from Washington which will be equivalent to a letter of intent.

Helping Wright Field

Mr. Berna reported on the work of the association's technical advisory committee which is helping Wright Field officials overcome difficulties in machining high heat-resistant metals and alloys for jet engines. One

NEW OFFICERS OF NMTBA

President
LLOYD D. MCDONALD, vice president Warner & Swasey Co.

1st Vice President
DAVID AYR, president Hendey Machine Co.

2nd Vice President
RICHARD E. LEBLOND, president R. K. LeBlond Machine Tool Co.

Treasurer
LOUIS POLK, president Sheffield Corp.

Directors for 3 Years
RALPH J. KRAUT, president Giddings & Lewis Machine Tool Co.
ALFRED V. BODINE, president The Bodine Corp.

of the problems is the machining of engine components in which the weight factor has been reduced to a minimum, resulting in extremely high quality specifications on minute surface imperfections which cannot be tolerated because of the possibility of setting up fatigue fractures.

At the end of July, 112,000 surplus machine tools had been selected for the Janmat reserve, Mr. Berna said. Of that number, 65,000 had been shipped by WAA to Janmat warehouses. It is doubtful whether the objective of 182,000 can be reached. A NMTBA committee has recommended changes in the method of storing Janmat machines, eliminating unnecessary time and money in disassembly.

The fact should be stressed that the average metalworking shop has only 200 employees and excels in the art of interchangeable manufacture, declared Mr. Berna. It is shops of such size, handling lots of 1 to 10 work units, in which the qualities of U.S. machine tools are of the greatest value.

"If we are going to do a real sales job with respect to the free enterprise system, we have got to sit down and talk to the teachers in our cities, to the clergymen, to labor leaders, and newspapermen, and to all of the people who have an important part to play in influencing the thinking of the general public," reported Jerome A. Raterman, president Monarch Machine Tool Co. and chairman NMTBA committee on public relations.

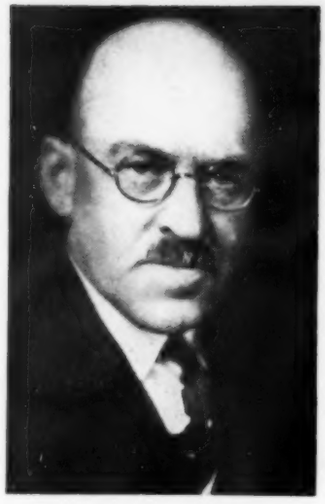
Moral Responsibility Cited

Mr. Raterman stated that to sell free enterprise successfully, industry must think less about the right to make a profit and more about its social and moral responsibilities. He continued, "My own philosophy is that a profit is something that should be earned by performing a service on behalf of the public welfare."

The person who wishes to sell free enterprise should do exactly what a machine tool company does in selling its products: (1) find out what its competitors are saying about the machines; (2) find out what its customers are saying; and (3) make a study of its product to find out whether any of the customers' complaints were justified.

The association committee on apprentice training standards is now in process of setting up minimum standards of eligibility for an association apprenticeship diploma, said J. Edward Goss, industrial activities administrator Brown & Sharpe Mfg. Co., committee chairman. The minimum recommended schedule is 6,000 hr. (3 years), but the committee urges 8,000 hr. (4 years) wherever possible. The committee is preparing a comprehensive booklet dealing with apprenticeship for distribution to members.

J. Robinson, chief engineer Vickers, Inc., and chairman hydraulic elements standards committee, made a report on hydraulics for machine tools, while W. B. Wigton, electrical engineer Cincinnati Planer Co. and chairman electrical standards committee, gave a detailed description of his committee's work. Daniel R. Weedon, assistant manager Blanchard Machine Co. and chairman sales and service committee, reported on the proposed machine tool sales conferences to be held in the summer of 1949.



Sen. R. E. Flanders

Mr. Weedon pointed out that no other capital investment offers the potential long-term earnings that machine tools do. The investor checks the securities in his portfolio to be sure of the earnings outlook of the companies represented by those securities. Why should not this same principle apply with respect to the productive equipment within a manufacturing plant?

"When a machine tool will pay for itself in 10 years," Mr. Weedon said, "it is selling at a price 10 times its earnings. But most machine tool models today will pay for themselves in five, or three, or even two years. Is there any field for long-term capital investment that offers a yield as attractive as that?"

Mr. Weedon's statements were backed up by a booklet published by NMTBA entitled "The World's Best Investment," which sets forth specific formulas used by companies in various industries in connection with machine tool replacement programs. The booklet is directed to financial and management executives in manufacturing corporations.

Carbides Boost Power Factors

Carbide tools have proved the need for more rigid and powerful machines, with motors up to 5 times the power of older machines, declared John E. Lovely, vice president Jones & Lamson Machine Co., in discussing trends in machine tool design at the NMTBA meeting.

Three to five times the surface speed is used with carbide tools compared with high-speed tools, with no reduction in feed or depth of cut. This development has decreased cutting time so much that more effort must be spent in designing machines to reduce handling and setup time and to reduce the manual labor of handling the large number of pieces the machines can produce.

Much must be done, Mr. Lovely said, to provide better protection for the operator against the throwing of chips and spattering of cutting oil. End cutting tool bits of tungsten carbide which may be rotated quickly are being used to bring fresh cutting edges into operation and to maintain size.

Mr. Lovely pointed out the trend toward: (1) use of aluminum instead of cast iron for many machine tool parts; (2) Chrome plating of handles, hand wheels and operating levers; (3) employment of servo and tracer mechanisms; (4) automatic sequential operation by means of electrical or hydraulic control; (5) interchangeable units for relays, pushbuttons and hydraulic elements; (6) automatic loading, transfer and handling.

Pakistan Placing Heavy Orders for Metal Goods

KARACHI, Pakistan (McGraw-Hill World News)—Heavy orders for steel and metal products are being placed overseas by the Pakistan government. Some 100,000 long tons of steel are understood to have been ordered from Belgium at a cost of $4,500,000, payable in sterling. Meanwhile, another $4,500,000 worth of railway materials have been ordered from America, Canada and Britain.

Standards Work Planned to Simplify Military and Civilian Procurement

NEW YORK—An important preliminary step in the standardization program of the Munitions Board is the formation of a Cataloging Agency, which will coordinate the efforts of the Army, Navy and Air Force. Heretofore, according to W. John Kenney, Under Secretary of the Navy, who was guest speaker at the 30th annual meeting of the American Standards Association, the services have maintained different cataloging systems, making difficult the interchange of supplies and equipment.

This common cataloging system is expected to be in full operation by 1952 and to effect great savings for the government. One agency alone, the Bureau of Ships, expects to save $25 million on an inventory of $282 million in the next six years. Considerable labor will also be saved.

What System Will Save

Under the system proposed, each item will be provided with a single name, description and identification number and will be classified in but one supply-commodity class. It is estimated that this process will eliminate about 50% of the 5 million items involved. Already 300,000 identification numbers for anti-friction bearings have been consolidated into about 9,000 items.

Also established is a new Standardization Agency, succeeding the Army-Navy Joint Specifications Board. Objectives are to promulgate specification and engineering standards and to study the areas and extent to which joint Army-Navy-Air Force equipment standardization is practicable.

Despite withdrawal of government agencies from direct participation in the work of the American Standards Association this past summer, both government officials and ASA people are hopeful that a way will be found to avoid duplicate specifications.

Government agencies cannot participate in the affairs of a private corporation, and ASA was incorporated under laws of New York State, after plans to obtain a Federal charter were shelved.

Government Cooperates

While ASA officials ponder legal means to re-obtain direct Federal cooperation, Government agencies are asking that their standards be reviewed by industry groups. Currently 47 electronics specifications of the Army-Navy Electronics and Electrical Standards Agency are being reviewed by ASA sub-committees with a view toward incorporation in working commercial specifications. The Services thereby hope that a correspondingly quick shift of industry to wartime production will be assured.

Likewise, the specifications the new Standards Agency, to bear "NME." (National Military Establishment) designations, will be sent through ASA procedure. Also, the agency will issue N.M.E. Engineering Standards which are mandatory for the military establishment when applicable, and industry will be encouraged to follow them in commercial drawings whenever possible.

ASA Standards Activity

But the American Standards Association is also expanding its activities. As evidence of progress, W. C. Wagner, new chairman of the Standards Council, reported that there are now 1000 ASA standards, that all existing standards will be reviewed at least every three years to bring them up to date. In the last year, 169 new standards were developed, 172 existing standards were revised or re-affirmed. Actual performance was three times that of the previous year.

Theme of the annual meeting was "What Good Are Standards." Convincing answers were provided by speakers well-qualified to indicate the importance of standards in manufacturing, design and purchasing.

In manufacturing, said Harold E. Hoefman, vice-president in charge of manufacturing, Link-Belt Co., use of standards reduces setup time, permits standardized operations, helps quality control, increases safety and reduces costs. Mr. Hoefman stated, for example, that the machine operator today obtains standardized tools, clamps, vises, etc. from the toolcrib, performs the assigned task without making such items, and with assurance that such items will fit on toolposts and machine tools standardized to receive them.

Purchasing for an industrial organization has become so complex, asserted V. de Goubeau of Radio Corp. of America, that standards are essential to give an exact understanding of what is wanted to suppliers of materials and parts. If the standards used are those developed by trade and technical associations, the probability of getting quality at lowest cost is high, but use of company standards often creates confusion. Furthermore, by purchasing standard items, the problem of supporting production lines is simplified, because the scheduling of deliveries and drawing from inventory become clerical functions.

Sale of Cars to Private Citizens in Russia Begins

MOSCOW—Public sales of automobiles to private citizens have been launched in four major Soviet cities —Moscow, Leningrad, Kiev and Tblilisi.

Models of the midget four-passenger "Moskvich" and the family touring car "Pobeda" are on exhibition in showrooms in the four cities. Other cities are scheduled to be added later this year and early next.

Thomas D. Jolly

Harold S. Osborne

***NEW OFFICERS** of the American Standards Association, elected at the 30th annual meeting, are: president, Thomas D. Jolly, vice president in charge of engineering and purchases of the Aluminum Company of America; and vice president, Harold S. Osborne, chief engineer of the American Telephone & Telegraph Co.*

Greater Output by Worker Seen Needed in U.S.

CLEVELAND—There is a threat to industry in the reduction of incentives in the United States, James F. Lincoln, president of Lincoln Electric Co., warned at the closing session of the National Production Meeting and Clinic held here Oct. 21-22 by the Society of Automotive Engineers. He proposed three steps to correct present poor conditions:

1. No worker should be forced to submit to any regulation on his output other than his own productive ability.

2. Government policies that create bureaucratic interference in private enterprise must be changed and laws that penalize hard work must be repealed.

3. Management must recognize its responsibility to the consumer to produce better products at less cost and see that all workers share and sense their part in the discharge of this responsibility.

A revolution in foundry methods within the next ten years was forecast by E. A. Canning, Director of Engineering, Allison-Bedford Foundry, Allison Dev. of General Motors at an earlier session. He said that foundry development has lagged behind other production methods.

In theory, Mr. Canning said, it should be possible to produce a perfect casting that is as good as a forging—but that perfect casting has not yet been made.

Reviewing the Antioch process of plaster castings, he said it is limited in economy but non-ferrous castings can be produced with superior qualities and in intricate shapes. Experiments now being carried on should bring startling developments in the process within a few years.

In establishing the plant to build the dynaflow transmission it was necessary to purchase 493 new machine tools; relocate, retool, and in some cases rework 180 others, Fred C. Pyper and A. G. MacDougall, Buick Division of General Motors. told several hundred production men attending the meeting. In addition, a large amount of foundry equipment, presses, and screw machines had to be retooled.

The project involved many precision finishing machines. Altogether more than 100 manufacturers were involved in the program. All of this, they pointed out, was for the tooling for the dynaflow used on the roadmaster model. At present time there are tooling programs for other models and the quantity is much greater now.

A case history in statistical quality control was discussed at an afternoon session when Dr. J. N. Berrettoni described the installation in the automotive plant of Minneapolis-Moline Power Implement Company. The system installed there has both increased the efficiency and lowered the cost of inspection he said. It has provided live records of quality which are a constant source of valuable information, lowered operation costs and increased assembly output.

***COILS** of flat steel which have been leveled and side-trimmed are sheared on this modern shear line in the new sheet and tin plate mill at the Pittsburgh, Calif., plant of Columbia Steel Co. at the rate of 300 fpm.*

G. N. Sieger Installed As President of AWS

PHILADELPHIA—George N. Sieger, Detroit, was installed as president for 1948-1949 term of the American Welding Society at the annual meeting here during the week of Oct. 24.

Mr. Sieger, a national authority on resistance welding, is a past president of the Resistance Welder Manufacturers Association.

Wartime Units Dropped

WASHINGTON — Most plant wartime labor-management committees set up by WPB request have been abandoned. Reports from 944 of the more than 5,000 plants which had these committees discloses 287 still functioning.

MEETINGS

American Society of Mechanical Engineers—Annual Meeting — Nov. 28-Dec. 3—Pennsylvania Hotel—New York City.

Materials Handling Show—Materials Handling Institute—Jan. 10-14—Convention Hall — Philadelphia—American Society of Mechanical Engineers to hold conference on materials handling concurrently with Show.

National Conference of Production Men—American Management Association—Nov. 18-19—Drake Hotel —Chicago

National Electronics Conference—Nov. 4-6—Edgewater Beach Hotel—Chicago.

National Time and Motion Study Clinic—Industrial Management Society—Nov. 3-5—Sheraton Hotel—Chicago.

National Tool & Die Manufacturers Association—Annual Meeting—Nov. 14-17—Hotel Schroeder, Milwaukee.

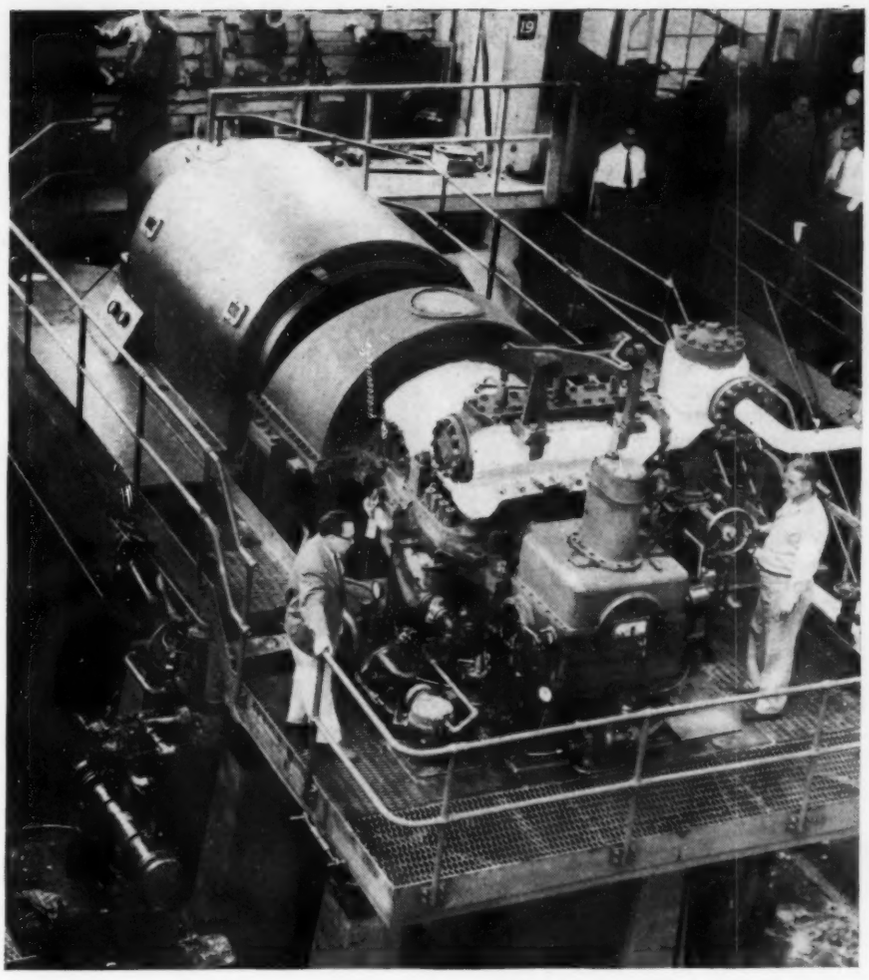
Society for Experimental Stress Analysis—Annual Meeting—Dec. 2-4 —Hotel Commodore — New York City.

P. H. Nolan New President of FEI

CHICAGO—P. H. Noland, president of B. F. Avery & Sons Co., Louisville, has been elected president of the Farm Equipment Institute and Theodore Johnson, president of J. I. Case Co., Racine, Wisc., chairman of the executive committee.

Mr. Johnson, J. L. McCaffrey, president International Harvester Co.; W. K. Hyslop, chairman of the board, Massey-Harris Co.; A. W. Phelps, president, Oliver Corp., were reelected for a three-year term to the committee. P. H. Knoll, president, Gleaner Harvester Corp., was named to fill an unexpired term of one year and H. C. Angster, secretary-director, National Association Domestic & Farm Pump Manufacturers, one year. Frank Silloway and H. G. Newcomer were chosen honorary members.

The following were elected vice presidents: H. T. Armstrong, president, Harriman Mfg. Co.; H. L. Boyle, vice president, Deere & Co.; L. R. Clausen, board chairman, J. I. Case Co.; C. Gordon Cockshutt, president, Cockshutt Plow Co., Ltd.; J. W. Gehl, secretary, Gehl Bros. Mfg. Co.; P. E. Herschel, Jr., president, R. Herschel Mfg. Co.; George A. Kelly, president, G. A. Kelly Plow Co.; Fowler McCormick, board chairman, International Harvester Co.; A. King McCord, vice president, Oliver Corp.; Wade Newbegin, president, R. M. Wade & Co.; Marshal Noel, vice president, Allis-Chalmers Mfg. Co.; Frank R. Pierce, president, Dearborn Motors Corp.; E. W. Ross, manager, Moline plant, Minneapolis-Moline Power Implement Co., and J. M. Tucker, executive vice president, Massey-Harris Co.



"PACKAGED" power plant, first to be completed at Westinghouse Electric Corp.'s new Sunnyvale, Calif., works, is shown ready for shipment to Mexico. The 5000-kw. units weigh 172,600 lbs. and comprise steam turbine, generator, condenser and necessary controls and accessories

Ray H. Morris & Co., Inc., Reorganized in Hartford

HARTFORD, Conn.—Ray H. Morris & Co., Inc., has been reorganized as a sales and service organization specializing in service for all makes of automatic and hand screw machines. It now acts as distributor for collets, feed fingers and other automatic screw machine replacement parts and tools for Brown & Sharpe Mfg. Co. It also is handling a line of lathe collets made by Sheffer Collet Co. Headquarters is at 7 South Main Street in West Hartford.

H. P. Good Named Founders' Head

ATLANTIC CITY—Herman P. Good, foundry superintendent, Textile Machine Works, Reading, Pa., was elected president of the Gray Iron Founders' Society at the annual meeting Oct. 14-15, succeeding H. A. Stockwell, treasurer, Barbour-Stockwell Co., Cambridge, Mass.

Other officers elected: John E. McIntyre, vice president and general manager, Sibley Machine & Foundry Corp., South Bend, Ind., vice president; Robert G. Schaefer, chairman of board and treasurer, Schaefer-Goodnow Foundries, Inc., Pittsburgh, secretary; and Henry J. Trenkamp, president, Ohio Foundry Co., Cleveland, treasurer.

Unions Growing

WASHINGTON—If the Taft-Hartley Law has hurt union membership the records do not show it. There are now 15,600,000 union members, an increase of 600,000 above the pre-Taft-Hartley days, according to the Bureau of Labor Statistics.

MDNA To Sponsor Tool Conference

PHILADELPHIA — The Machinery Dealers' National Association will sponsor a Machine Tool Conference at the Wharton School of Finance & Commerce, University of Pennsylvania, Nov. 5 and 6.

Management and marketing problems will be studied and the sessions are open to MDNA members and their employees.

George B. McClennen, Delta Equipment Co., will be chairman.

Packaging Machinery Unit Elects H. Kirke Becker

NEW YORK—H. Kirke Becker, Peters Machinery Co., Chicago, was elected president of the Packaging Machinery Manufacturers Institute at its 16th annual meeting at the Roosevelt Hotel Oct. 12-13.

Detroit

BUICK STRIVING FOR NO. 3 SALES POSITION . . . DELIVERY DATES ON TOOLS LAGGING . . . FERGUSON TRACTORS ROLLING

At Flint, where Buick is just beginning production on 1949 models in the upper two of its three series, the atmosphere is optimistic and decidedly aggressive. In a quiet way, Buick has its eye on the No. 3 sales position of the industry, just about as intently as the more publicized aims of Ford to displace Chevrolet in the top spot.

Buick does not anticipate that it will be able to move into third position, ahead of Plymouth, in the near term. Steel shortages will hold the division's output in historical proportions. But the Flint manufacturer of the General Motors family has enlarged its capacity to where it can build a half-million vehicles on a one-shift basis, and perhaps another 50,000 on top of that by a little straining in bottleneck departments on added shifts. Output of 550,000 units would close the gap between Buick and the average high prewar ranges of Plymouth.

To get up in this rarified range of selling for a medium-high-priced line, Buick may add close to 500 dealers to its field organization in the coming year or two. Most of these, probably, will be put on in the rural areas, where the company's representation has been lighter than in its carefully blanketed metropolitan areas. The goal then will be to bring the non-metropolitan sales up to the positions held in the cities—it is probably noteworthy that at numerous points Buick was the biggest seller before the war, and rated second in several others.

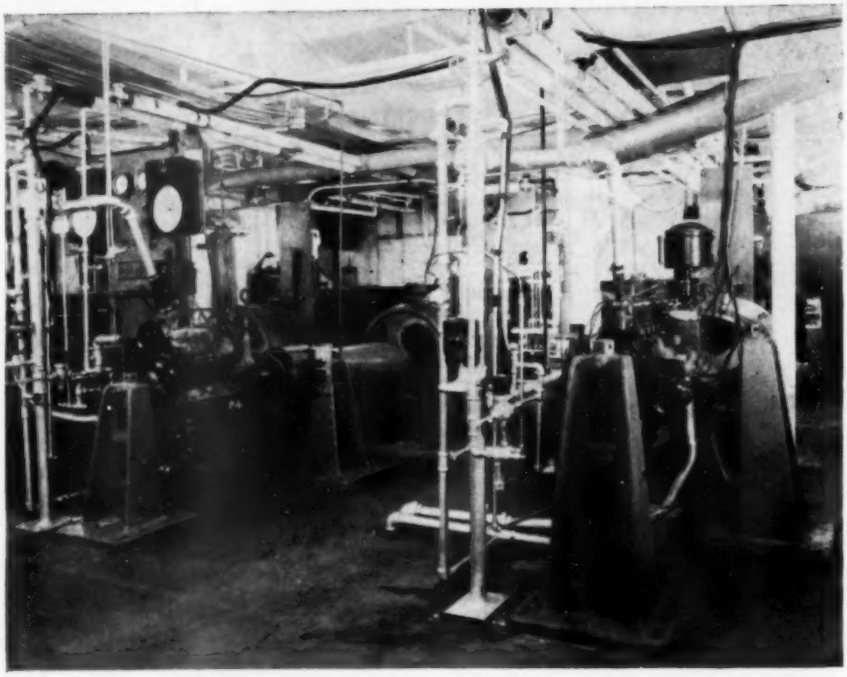
One thing which Buick expects will aid its drive is the availability of its Dynaflow drive in all series. All Roadmasters—the top line—will carry this torque converter today; the 1949 supers will offer it as optional for the first time. Likely the special series, the base-price jobs, will also offer it later.

Tooling For Specials

The Buick specials will come onto the market after the first of the year. They are now being tooled. The tooling for this job is now placed, along with the bulk of tooling for two other G.M. offerings, Pontiac and Chevrolet.

Interestingly enough, these companies and others report some modest slowdown in getting new tools and dies. Delivery promises recently were about the same, but actual deliveries, they say, seem to be running longer, and current promises are therefore lengthening.

One reason for this, experts in another field of observation believe, might be the reluctance of tool shops to work on Saturdays, due to contracts providing premium pay for Saturday "as such"—which have the effect of pyramiding overtime on overtime, in accordance with the recent dictum of the Supreme Court.



***AUTOMATICALLY-CONTROLLED** laboratory at the National Bureau of Standards has been set up to study automotive engine wear. Under the control of a master clock, the engines are simultaneously put through a cycle consisting of cold starting and warm-up, speed-up, idling, stopping, and cooling periods. The automatic recorders adjacent to the panel board provide a complete record of individual engine operation over 24-hours*

Those tooling problems have been bypassed by Frazer, Nash, and Cadillac, all of whom showed their 1949 cars in October. The Nash, as reported earlier, was drastically restyled. Cadillac's new engine, with compression ratio of 7.5 to 1 (highest of any American production car), featured its line. Frazer raised its engine horsepower from 100 to 112, and refurbished its bodies.

Indicative of the steady upward march of prices were the new quotations on the Nash; the Super 600 series advanced an average of $275 at factory list, the Ambassador, $390. High passenger car prices are creating problems on the used car lots. With the advent of colder weather, business has slowed down to a walk, and going price levels have cracked from 10% to 20%. This happened last winter, but not till about December—some think that the earlier break this year presages the actual end of the seller's market for the industry as a whole. The effect of seasonal improvement next spring, however, may have to be awaited before any positive conclusions can be drawn.

First Ferguson Tractor

A fillip was given the farm implement field in October when Harry Ferguson drove the first tractor off the lines of his new $10-million plant on Detroit's northwest side. The new Ferguson tractor is completely an assembly job. From the tooling standpoint, considerable interest attached to the statements by the Irish inventor that a "revolutionary" new line of farm implements was being developed in England, one which probably would be shown in this country by late next summer. The manufacture of these implements, said Ferguson, would be done by contract producers, as is the case on the present line.

Not to be outdone, the arch-rival of Ferguson, Dearborn Motors Corp. (distributor organization for the Ford Tractor) announced creation of a new manufacturing and engineering division. Dearborn will develop new products in this department.

Thousands of 'em!

Thousands of Precisionaire standard semi-finished gaging plugs are carried in stock for quick delivery.

Shipments made within one week from receipt of complete information—24 to 48 hours in emergencies.

This world's largest stock of "immediately available" air gage tooling protects Precisionaire users against production holdups or shutdowns.

Sheffield's interest does not diminish with the purchase of a Precisionaire. The instrument must be kept constantly useful. Quick tooling service from this great stock assures you uninterrupted performance throughout the long life of the instrument.

It is wise and thrifty to specify Sheffield.

5009

Sheffield's principal products include Gages, Measuring Instruments, Machine Tools, Threading Tools and Contract Services. Standard Gages shipped within 24 hours.

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MASTER CRAFTSMEN SHEFFIELD HEADQUARTERS

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***Carblox Price List**

*Prices subject to change without notice

Accuracy A: .000004"	B: .000008"	
82 Block Set	82A	$1400.00
	82B	1175.00
33 Block Set	33A	695.00
	33B	495.00
14 Block Set	14A	245.00
	14B	174.00

Immediate delivery

CARBLOX

Webber CARBIDE GAGE BLOCKS

ORDINARILY several weeks are required for delivery of carbide gage blocks as most of them are made up as requisitions are received. However due to sizeable order recently completed, we have a few sets available for immediate shipment.

The extreme hardness, wearability and precision of Carblox is unexcelled. It is outstanding for providing precision control day after day, taking abuse and punishment without affecting their accuracy even after years of use. Carblox are available for immediate delivery in standard sizes and sets or can be built to your requirements.

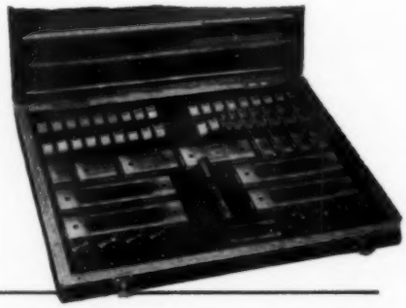
WEBBER GAGE COMPANY

12901 Triskett Rd. Cleveland 11, Ohio

Carblox Wear Gages add the wearing qualities of carbide to any standard steel gage block set. Set of 2 with case Two Sizes
.050 ..... $27.50
.100 ..... 21.50

Webber

MICRO-ACCURATE GAGE BLOCKS and FIXTURES



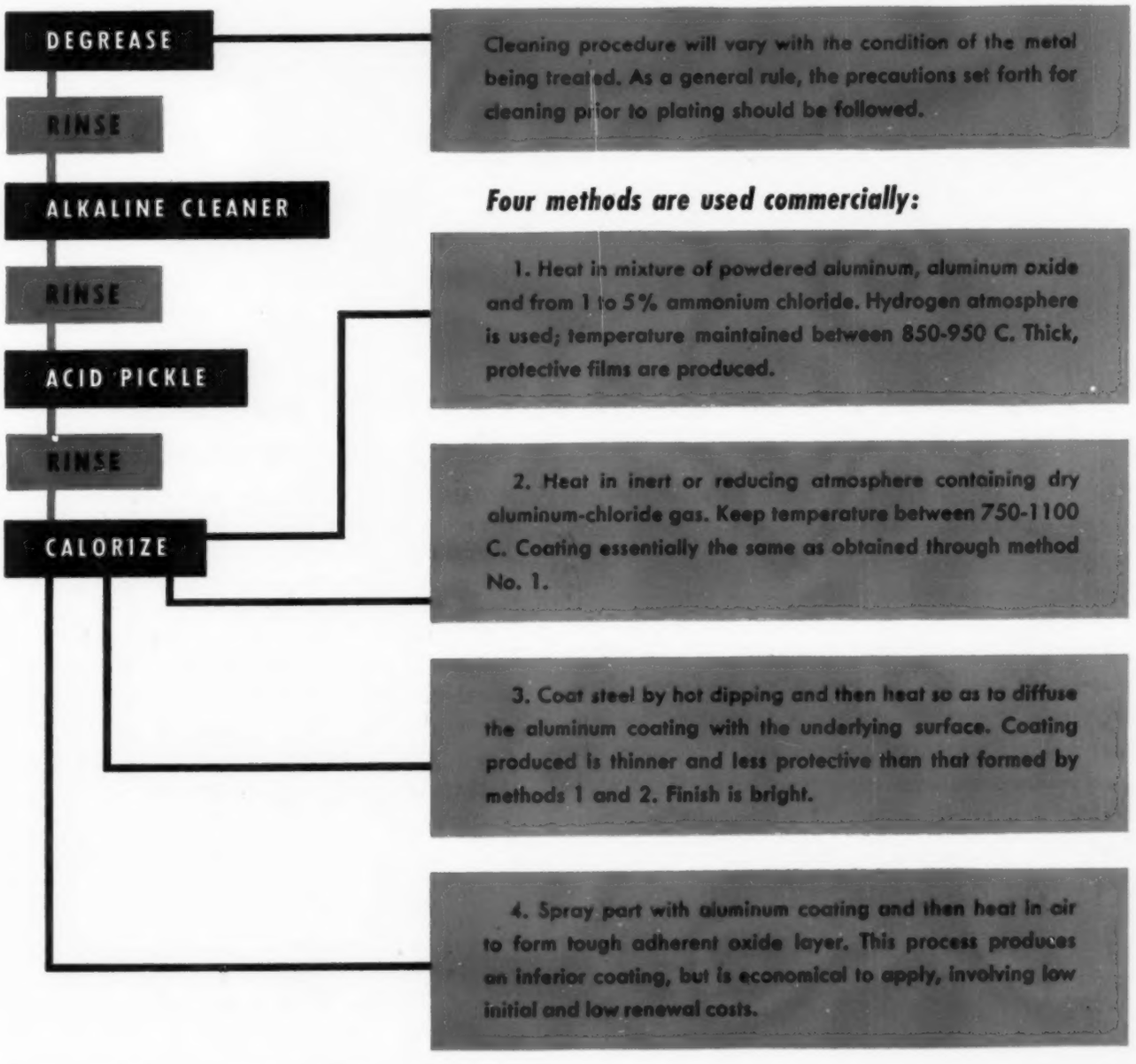
Transferring the extreme precision of gage blocks to the work is one of the outstanding advantages of Webber Heavy Duty (Steel) Gage Blocks and Fixtures. Used as Scriber, Divider, Height Gage and Snap Gage.

American Machinist REFERENCE BOOK SHEET

Process Sheet For Calorizing Steel

BY GEORGE BLACK

CALORIZING covers a variety of methods for applying and diffusing aluminum to steel (and other metal) surfaces. It is intended primarily for the protection of iron from oxidation at elevated temperatures. Calorized metals will withstand severe deformation; they are resistant to sulfurous gases and to fused salts at high temperatures. Calorizing is recommended for oil-refining equipment such as tube stills for cracking and topping, as well as for valves, retorts and condenser parts. It is also widely used for furnace parts, including conveyors, stokers, roasters, carburizing and heat-treatment boxes and kiln parts; and is enjoying increased use in Diesel-engine construction and in miscellaneous fields where resistance to oxidation and sulfur attack at high temperatures is involved.


DEGREASE
RINSE
ALKALINE CLEANER
RINSE
ACID PICKLE
RINSE
CALORIZE
Cleaning procedure will vary with the condition of the metal being treated. As a general rule, the precautions set forth for cleaning prior to plating should be followed.
Four methods are used commercially:
1. Heat in mixture of powdered aluminum, aluminum oxide and from 1 to 5% ammonium chloride. Hydrogen atmosphere is used; temperature maintained between 850-950 C. Thick, protective films are produced.
2. Heat in inert or reducing atmosphere containing dry aluminum-chloride gas. Keep temperature between 750-1100 C. Coating essentially the same as obtained through method No. 1.
3. Coat steel by hot dipping and then heat so as to diffuse the aluminum coating with the underlying surface. Coating produced is thinner and less protective than that formed by methods 1 and 2. Finish is bright.
4. Spray part with aluminum coating and then heat in air to form tough adherent oxide layer. This process produces an inferior coating, but is economical to apply, involving low initial and low renewal costs.

Speeds up to 500 surface feet per minute; Feeds up to 50 inches per minute

OK FREE-CUT carbide tipped face mills *"engineered for the job"* are designed for the new high horsepower, high-speed milling machines geared to meet today's need for *low-cost production.*

Series 3600 has the famous OK two-piece construction—*body* and *blades.* Tapered, wedge-shaped blades with mating serrations provide a combination lock that holds blades fast, straight and true under the most severe conditions. *No screws, pins, gibs or other locking devices are needed.* This simplicity plus more beef in the bodies adds the extra strength so necessary in modern high speed milling operations.

Performance records in the field over the past five years prove these FREE-CUT face mills capable of operating at speeds up to 575 surface feet and feeds up to 50 inches per minute on cast iron, with minimum horsepower consumption. They are supplied with **various combinations of positive and negative axial and radial rakes and lead angles,** depending on the machine, the material and design of the workpiece.

FACE MILLS: from 8 to 24 inch diameter. END MILLS and SHELL END MILLS: from 4 to 8 inch diameter.

Write today for new circular 36 on OK FREE-CUT *Face Mills.*

THE OK TOOL COMPANY, Inc.
Since 1901
26 HULL ST., SHELTON, CONN.

American Machinist REFERENCE BOOK SHEET

Chart for Lineshaft Calculations

By TYLER G. HICKS

OFTEN during design and erection work, quick determination of line-shafting size is necessary. The alignment chart shown permits rapid sizing of hot-rolled or turned-steel shafts when rpm., horsepower and type of loading are known. The chart, which is based on the relation

$$d = \sqrt[3]{90 \text{ hp./rpm.}},$$

can be used for finding any one variable when the other three are known.

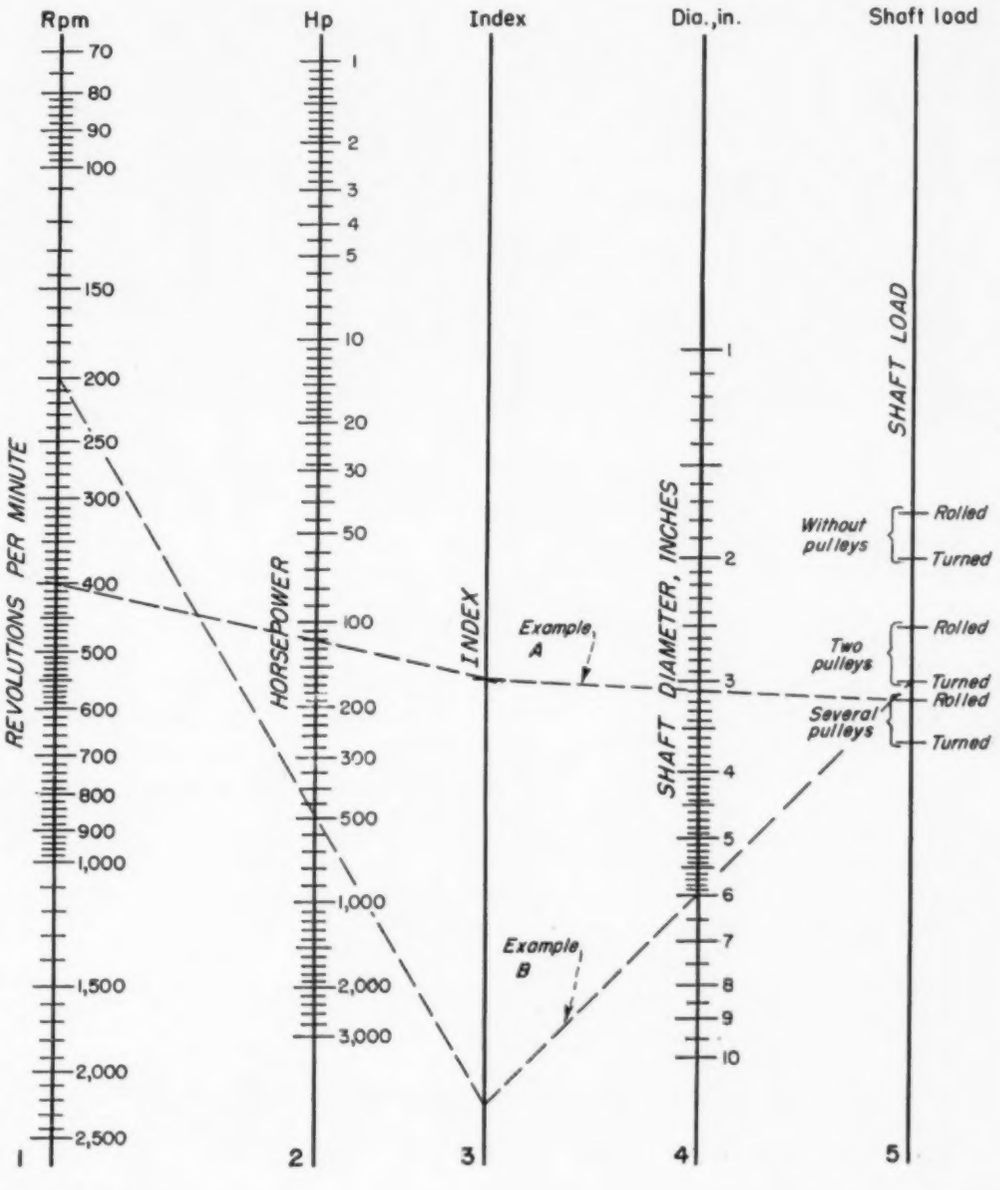
Shafting of six different types can be analyzed; hot-rolled and turned shafts without pulleys; hot-rolled and turned shafts with two pulleys, both close to the bearings; hot-rolled and turned shafts with several pulleys in random positions along the shaft. In each case, support of the shaft by two bearings, not more than 8 ft. apart is assumed. Use of the chart will be shown by two examples.

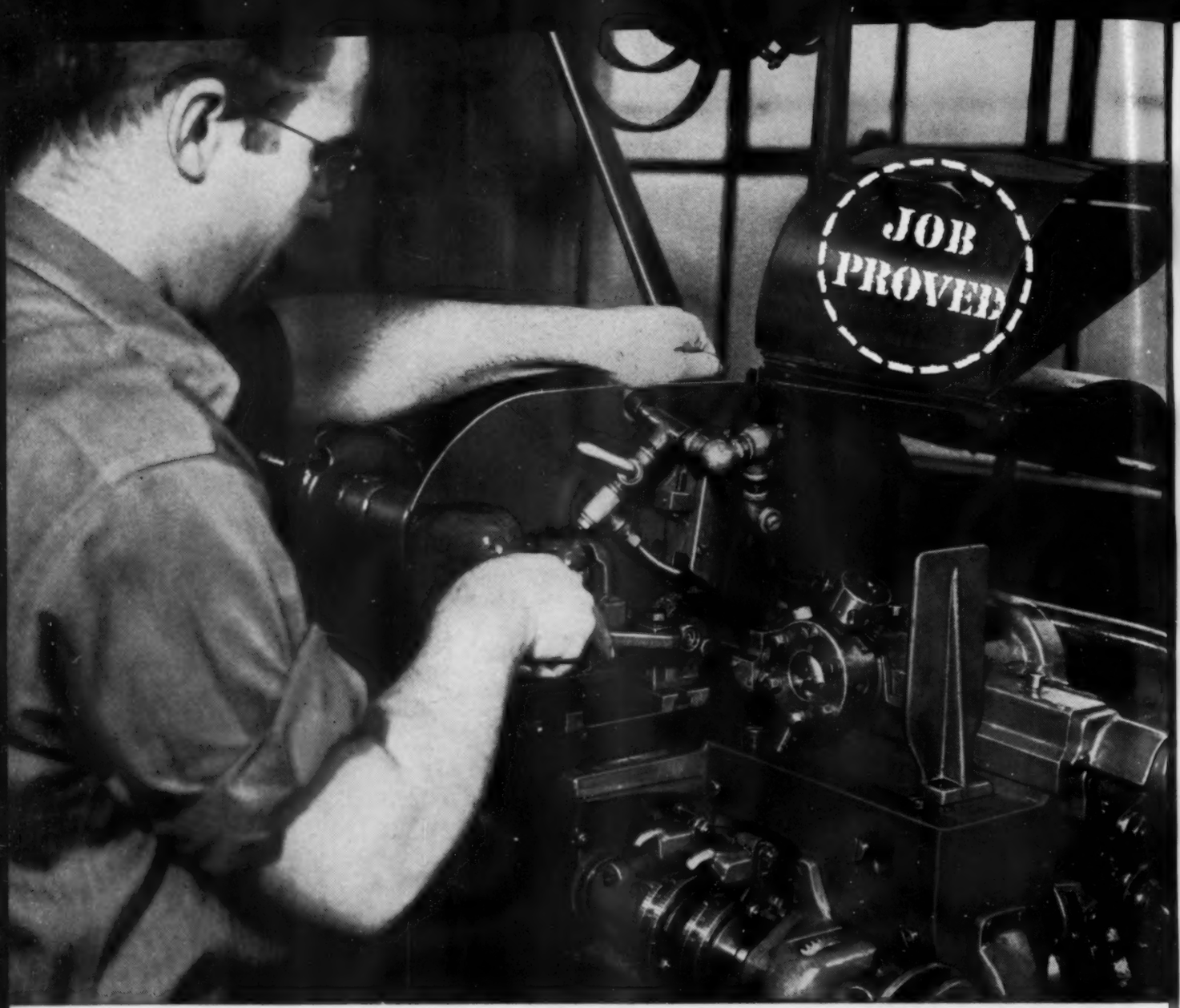
Example *A:* A hot-rolled steel lineshaft with several pulleys unequally spaced will be required to transmit 123 hp. at 400 rpm. What diameter shaft is necessary?

Solution: From 400 rpm. on axis 1, draw a straight line through 123 hp. on axis 2 and extend the line to axis 3. Draw a straight line from the point of intersection on axis 3 to "rolled shaft with several pulleys" on axis 5. Intersection of this line with axis 4 gives the required diameter as 3.10 in.

Example *B:* What horsepower can a 6-in. turned-steel shaft with two pulleys close to the bearings transmit at 200 rpm.?

Solution: From "turned shaft with two bearings" on axis 5, draw a straight line through 6-in. dia. on axis 4 and extend to intersect axis 3. A straight line through the point of intersection on axis 3 to 200 rpm. shows on axis 2 that a 6-in. turned-steel shaft with two pulleys will transmit 480 hp. at 200 rpm.





TOOL LIFE TRIPLED

Sunicut with Petrofac* Improves Finishes and Lengthens Tool Life in Intricate Machining Job

In the machining of small parts for radios, a shop was using a dark cutting oil with poor results. Finishes were rough, tool life was unsatisfactory. The dark oil made the work hard to see.

Changing to Sunicut with Petrofac, the plant found the ideal oil for its purpose. Its cooling and lubricating qualities are producing excellent finishes, and increasing tool life from 10 hours to 30 hours. Further, machinists can see the work better through this transparent oil.

Job: Turning, forming, threading, pointing
Machine: Brown & Sharpe OOG Automatic
Part: Stud pulley for radio
Material: B 1112 steel
Tools: Rex AA high-speed circular form tools
Spindle Speed: 2,600 R.P.M.
Cutting Speed: 165 S.F.P.M.

These new grades of Sunicut with Petrofac are making possible better finishes than ever, and faster work in a wide range of operations. The new Sunicut grades with Petrofac possess superior metal-wetting, anti-weld, and extreme-pressure qualities. They are not blended with animal or vegetable fatty oils—cannot turn rancid. For additional information about the various Sunicut cutting oils, write for folder **AM-11.**

SUN OIL COMPANY • ***Philadelphia 3, Pa.***
In Canada: Sun Oil Company, Ltd.
Toronto and Montreal

*Petrofac is a trademark of Sun Oil Company.

SUN PETROLEUM PRODUCTS
"JOB PROVED" IN EVERY INDUSTRY

SUNOCO

Tool Angles for Machining Meehanite Castings

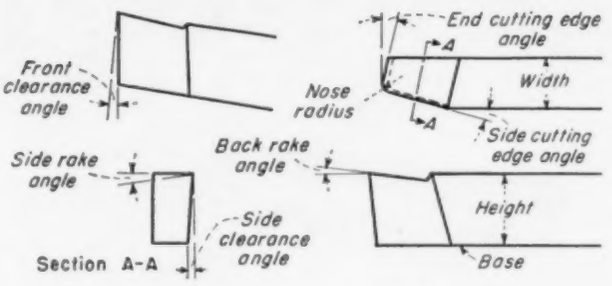
SOURCE: MEEHANITE METAL CORPORATION

Meehanite castings are machined with high-speed steels, cast cutting materials and cemented carbides. Research and shop usage have demonstrated that Meehanite makes a good shank material, because it conducts heat rapidly from the tool tip and absorbs vibration. Machinability ratings by simple drill test are:

MATERIAL	BRINELL HARDNESS	TOOL PRESSURE, Lb.
Meehanite Type GA	220	49
Meehanite Type GB	210	51
Meehanite Type GC	200	48
Meehanite Type GE	175	38
Gray Iron	—	41
Gun iron	210-220	58
High-test iron	285	67
1040 steel	163-197	58-62
3140 steel	223-255	53-56

Shanks cast with 10° side and front relief which become secondary clearance on finished tool. Right hand tools shown.

TOOL SHAPES RECOMMENDED FOR ROUGHING CUTS ON LATHE, PLANER, AND BORING MILL



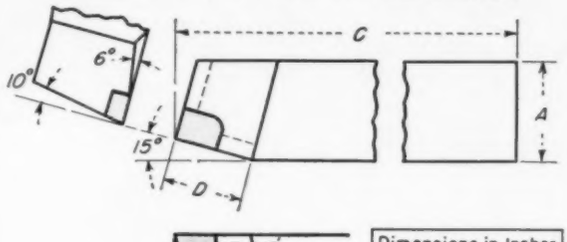
	HIGH-SPEED STEEL TOOLS			TUNGSTEN CARBIDE TOOLS		
	Lathe	Planer	Boring Mill	Lathe	Planer	Boring Mill
Side cutting edge angle	6°-10°	8°-10°	6°-10°	8°-10°	5°-10°	6°-10°
End cutting edge angle	8°-12°	8°-12°	5°-8°	8°-10°	8°-10°	10°-12°
Front clearance angle	2°-4°	2°-4°	4°-6°	4°-6°	4°-6°	2°-6°
Side clearance angle	2°-5°	2°-5°	2°-8°	4°-6°	4°-6°	4°-6°
Back rake angle	4°-8°	3°-5°	0°-4°	0°-4°	0°-8°	0°-2°
Side rake angle	6°-10°	6°-10°	6°-8°	2°-6°	2°-6°	2°-10°
Nose radius	1/8"-1/4"	1/4"	1/8"-3/16"	1/8"	1/8"	1/32"-1/4"

CUTTING SPEEDS FOR VARIOUS GRADES

Type of Tool Material	Meehanite Types GE and GD SFM	Meehanite Types GC and GB SFM	Meehanite Types GA and Gm SFM
High-Speed Steel	80	60	40
Cobalt High-Speed Steel	100	75	50
Stellite and Rexalloy	150	100	75
Tungsten Carbide	300	250	200

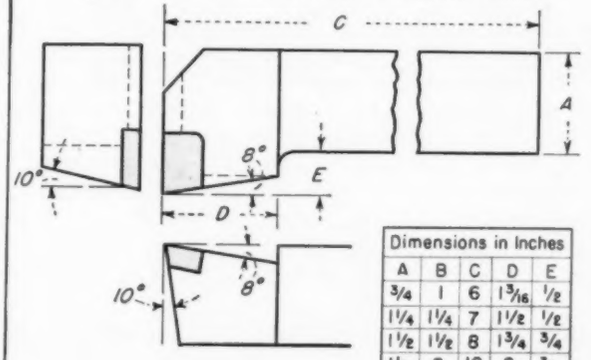
(The above figures are based on average roughing cuts—medium-sized machines.)

STANDARD TURNING TOOL WITH LEAD ANGLE



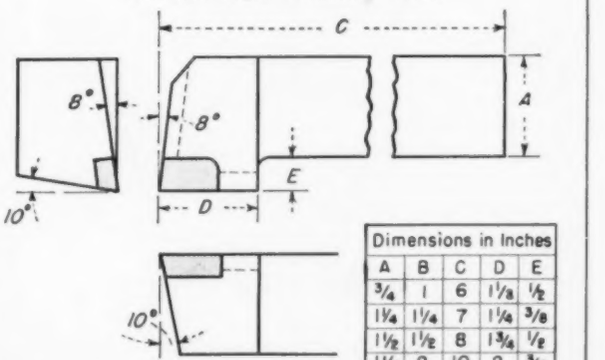
Dimensions in Inches			
A	B	C	D
3/4	1	6	1
1 1/4	1 1/4	7	1
1 1/2	1 1/2	8	1 1/2
1 1/2	2	10	2

OFFSET FRONT FACING OR TURNING TOOL



Dimensions in Inches				
A	B	C	D	E
3/4	1	6	1 3/16	1/2
1 1/4	1 1/4	7	1 1/2	1/2
1 1/2	1 1/2	8	1 3/4	3/4
1 1/2	2	10	2	3/4

OFFSET SIDE TURNING TOOL



Dimensions in Inches				
A	B	C	D	E
3/4	1	6	1 1/8	1/2
1 1/4	1 1/4	7	1 1/4	3/8
1 1/2	1 1/2	8	1 3/4	1/2
1 1/2	2	10	2	3/4

the grinding job

Surface grinding alloy steel plug on 16" Arter Rotary Surface Grinder. This job is typical of many performed on hardened, special alloy steels requiring cool, free cutting grinding wheels. Such jobs are common to tool rooms, machine shops and production lines.

the wheel

W Borolon vitrified bonded, WA46-H8-VI, 14" x 1½" x 5" which is standard for this class of work due to its ability to grind fast and cool without burning expensive steel stock. Heavy stock removal or close tolerances may be obtained as desired.

Borolon ALUMINUM OXIDE *Electrolon* SILICON CARBIDE

SIMONDS ABRASIVE CO.

PHILADELPHIA, PA.

Grinding Wheels

where to get it

From your Simonds Abrasive Co. Distributor located in all key industrial centers here and in many foreign countries. He carries local stocks and can advise on grinding wheel selection. Write today for our Grinding Wheel Data Book, 112 pages of practical information about grinding wheels and their uses. Also contains name and address of distributor serving your area.

Every size and shape for every grinding job . . . centerless, crankshaft, cut-off, cylindrical, internal, knife grinding, mounted points, portables, roll grinding, saw gumming, snagging, surfacing (wheels and segments), tool and cutter, bricks, sticks, stones and abrasive grain for polishing, pressure blasting, anti-slip, etc.

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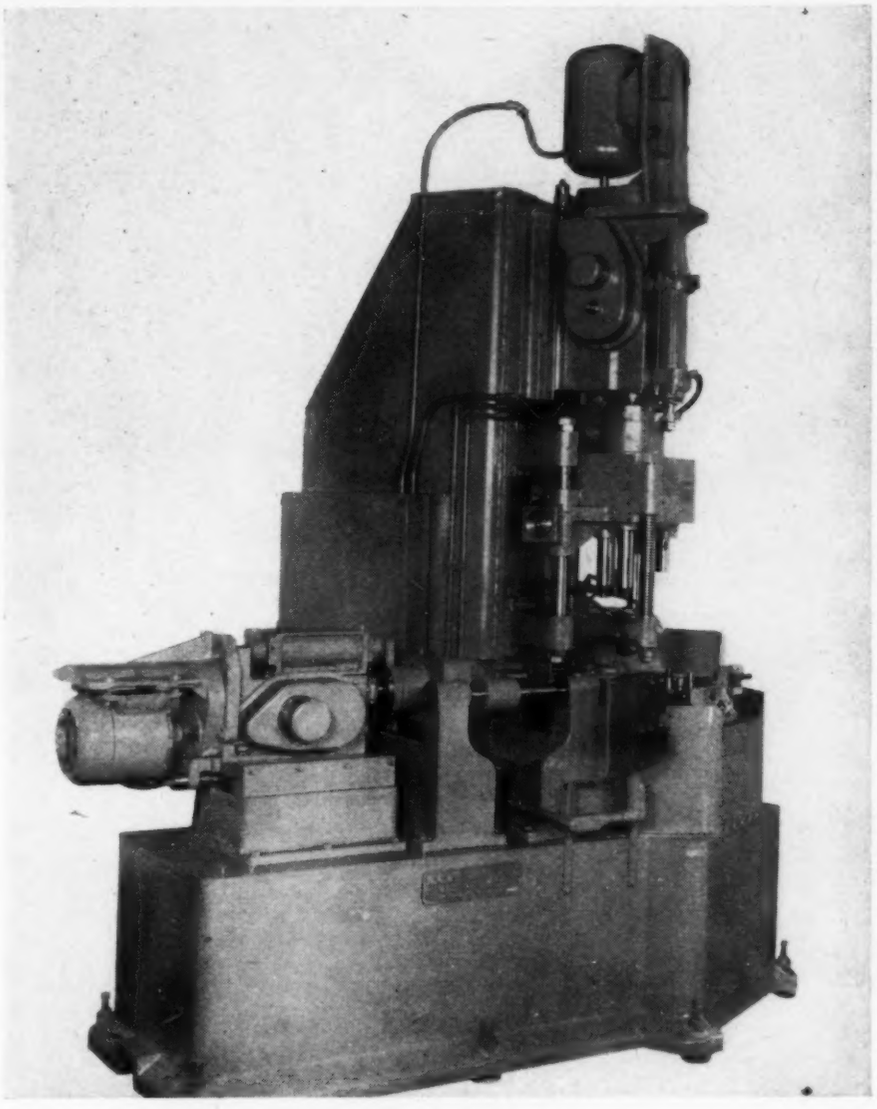
Shop Equipment News



Millholland Automatic Index Machine Has a 10-hp. Capacity; 6-in. Stroke

The No. 5 Millholland automatic index machine is offered by Millholland Machine Co., 1048 Fairfield Ave., Indianapolis 5, Ind. Incorporated in the vertical position is the redesigned No. 5 automatic unit which has a 10-hp. capacity and 6-in. stroke. The horizontal side head shown is the No. 4 size with a 5-hp. drive and 5-in. stroke.

The automatic index table is independently motor-driven and synchronized with the movement of the units by means of limit switches. It can be had in various sizes up to 42 in. with indexes up to 600 or more per hr.

Machine is suitable for drilling, reaming, tapping, counterboring, chamfering or spot-facing operations. The redesigned automatic unit features improved feed clutch, redesigned pneumatic counterbalance and heavier spindle construction.

Units are self-contained and individually motor-driven. The automatic drilling, tapping, and milling unit can be changed over from one production job to another.

Heavy-Duty Multiple Drillhead Made in 2- to 8-Spindle Models

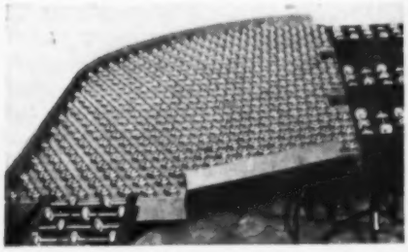
A heavy-duty series of multiple, adjustable drillheads has been announced by Strutz & Mead, Inc., Milwaukee, Wis., for the Wisconsin Drill Head Company. Part of the Kwick-Change line, the series is made in 2- to 8-spindle models. Bolt circles vary from 2 3/16 to 14 63/64 in. in the 2-spindle head, to 7 31/64 to 20 17/64 in. in the 8-spindle head.

Heads will drill holes up to 1¼ in. in diameter in cast iron. They are equipped with No. 2 Morse Taper spindles having a 1-in. vertical drill adjustment, and are of anti-friction bearing construction throughout.

Dril-Hamer Converts Rotary Motion to Hammering Action

Dril-Hamer Mfg. Co., Inc., 82-27 Grenfel Ave., Kew Gardens, L. I., offers the Dril-Hamer handtool. The tool is used to convert rotary motion of any ¼-in. electric drill, drill-press, or chuck-equipped flexible shaft, into hammering action for any purpose. It strikes blow-per-revolution with a force which is always the same regardless of speed. The Dril-Hamer accommodates No. 6 through ⅝-in. dia. standard drillbits for masonry drilling. Peening, riveting, boiler-scaling, paint-removal, and blank bits are also available.

CLEANING UNIT, called the Turco-Hydro-Steam unit, is offered by Turco Products, Inc., 6135 South Central Ave., Los Angeles 1, Calif. The unit can be used wherever a steam line pressure of 80 to 150 lb. is available. Weighing 28 lb., it is portable and can be disconnected for removal to other parts of the plant. The model utilizes the steam line pressure to supply the proper amount of cleaning solution in a regulated steam flow



Ball Transfer Table by Sage Handles All Types of Packages

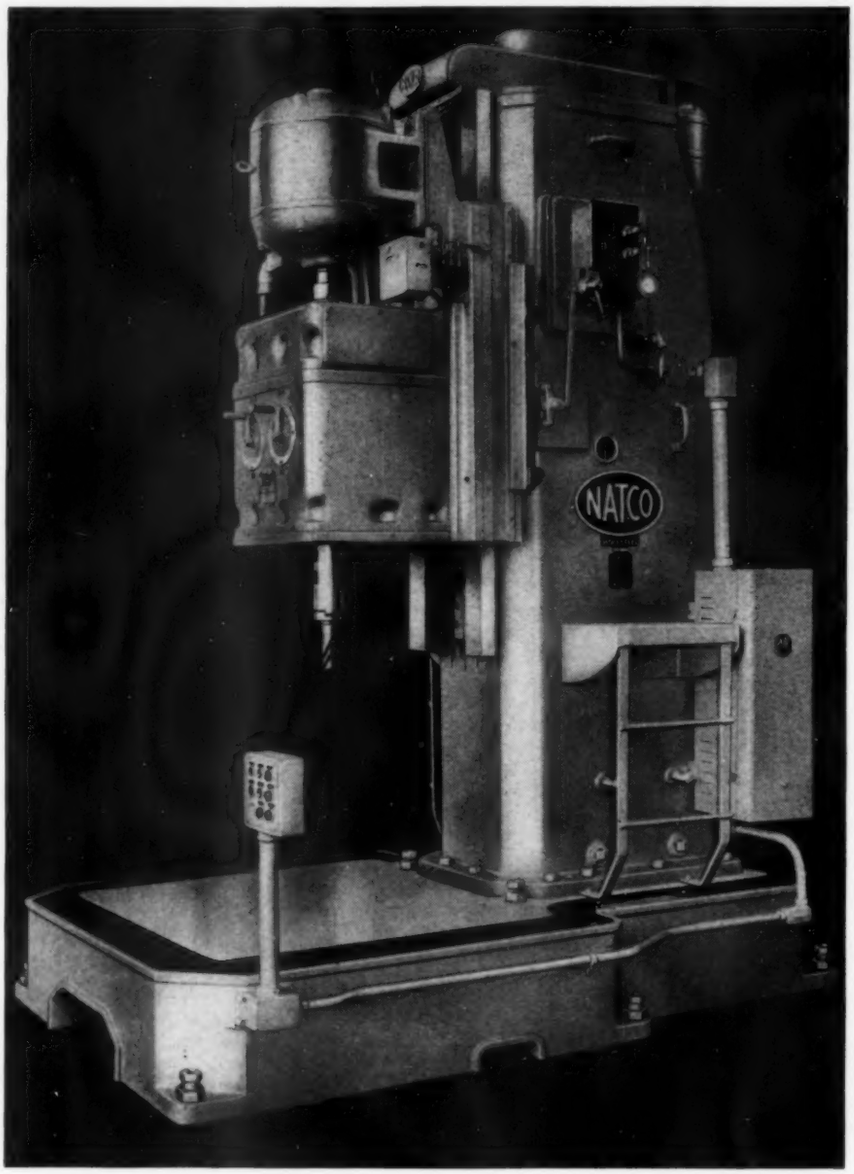
Sage Equipment Co., 30 Essex St., Buffalo 13, N. Y., offers a ball transfer table for handling all types of packages and cartons with flat bottoms. Construction allows handling of loads to 10,000 lb. Using this table, articles can be removed from all types of conveyors for inspection or other purposes without interrupting the continuous flow.

See-All Thread Staging Fixture Inspects by Optical Projection

The See-All thread staging fixture, for inspection by optical projection of screw threads ranging in diameter from 0.073 to 1.000 in., is manufactured by Engineers Specialties Div., The Universal Engraving & Colorplate Co., Inc., 980 Ellicott St., Buffalo 8, N. Y. The universal type fixture was designed for use with various types of comparators. Adaptors can be supplied for certain comparators where necessary.

When used with the ESD co-ordinated thread Chart-Gage screens, the pitch diameter, major diameter, minor diameter, crest flank angle, worm-tool allowance and lead of any screw thread from 0.073 to 1.000 in O.D. can be gaged. A set of 25 setting masters is supplied with the fixture. The See-All thread staging fixture, including two sets of V-assemblies, 25 setting masters, specification data table, with lock-type leatherette case, is $390 complete.

The "normal-two-helix" thread charts are available for those whose gaging practices require the staging of American National Form threads to the correct helix angle. Thread chart-gage screens cover the range of standard thread sizes for Class 2 and Class 3 fit.



Natco Single Hydraulic Drilling Machine Has Single-Spindle 7-Speed Head

A heavy-duty hydraulic drilling machine with a single spindle 7-speed geared head has been announced by National Automatic Tool Co., Dept. 20, Richmond, Ind. The machine was developed to test the durability of drills, and is equipped with a 30-hp. motor which maintains a synchronous speed up to the rated hp. when drills become dull. As the load builds up to a predetermined value a torque limiting device operates to stop the motor. A range of 42 speeds is possible through change gears.

INDIANA GEAR WORKS

South Wind DIVISION STEWART WARNER CORP.

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FAMOUS MANUFACTURERS *use* LODGE & SHIPLEY *Lathes*

Century

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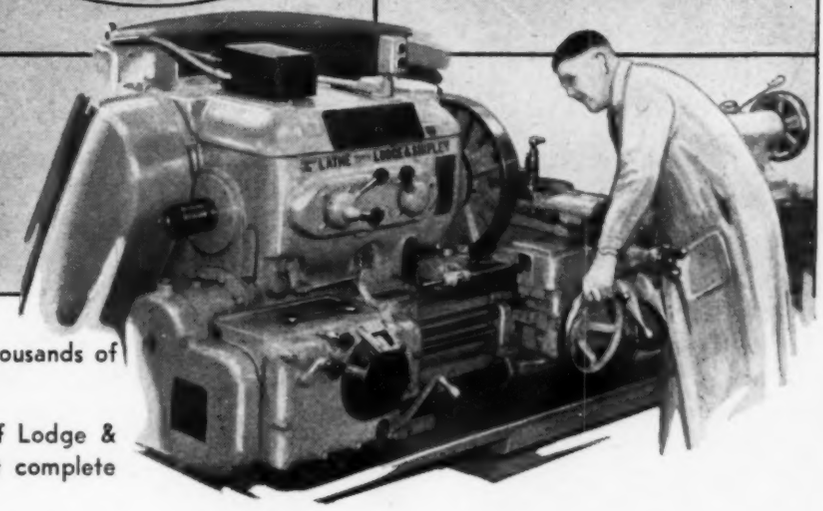

• These names represent but a few of the thousands of satisfied users of Lodge & Shipley Lathes.

In a continuing survey of the performance of Lodge & Shipley Lathes, plants large and small report complete satisfaction:

"A very good lathe" "The finest lathe we have ever used" "Production up 300%" "Time saved, 65%" "Accurate to extremely close limits."

Lodge & Shipley Engineers will gladly show you the amazing facts discovered in this survey, demonstrate on your own work how Lodge & Shipley Lathes can do your work faster, better and at lower cost. Write for Condensed Catalog.

THE **Lodge & Shipley** COMPANY

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SPECIAL PRODUCTS DIVISION • 800 EVANS ST.
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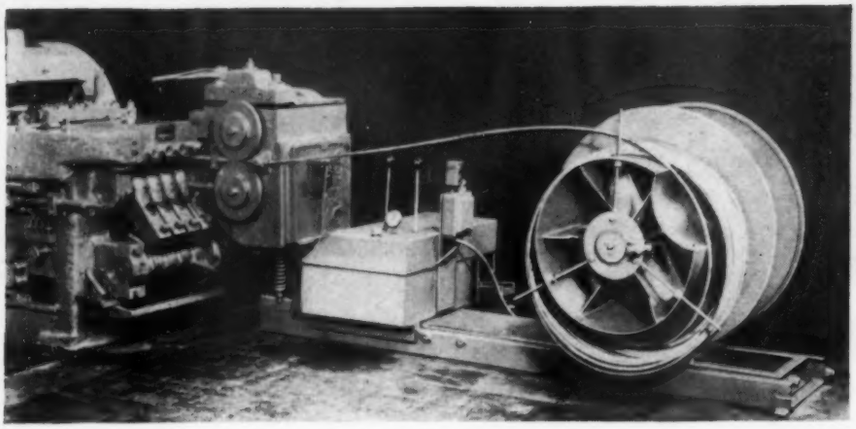
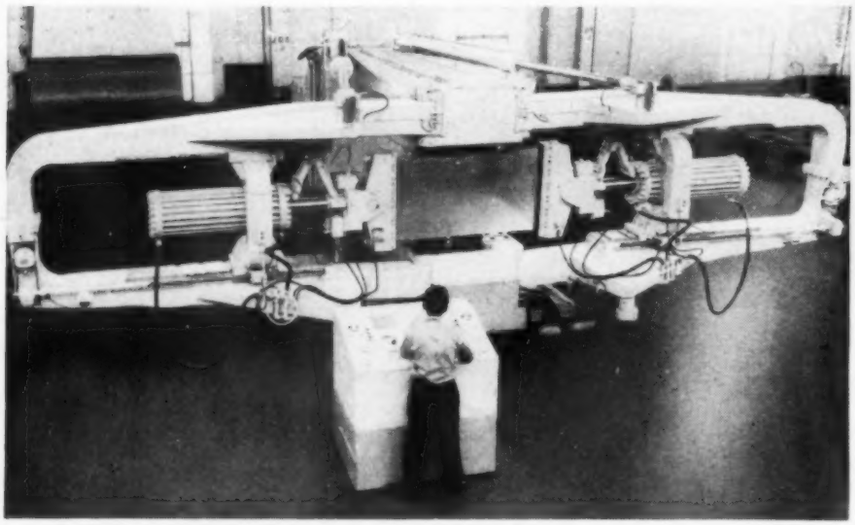


Hydraulic Straightening Device Offered By National Machinery

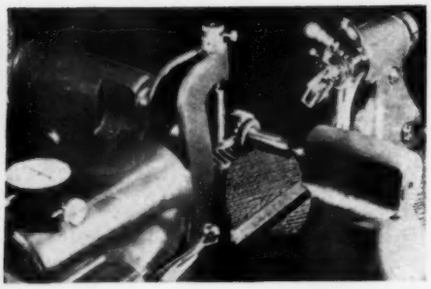
A hydraulic straightening device is offered by National Machinery Co., Tiffin, Ohio, for use on cold-heading equipment using heavy wire, or coiled hot rods. The device is said to reduce downtime caused when feeding a new coil of wire into a machine by mechanically straightening a length long enough to pass through the feed tube and rolls, and by supplying power to push the straightened length into the machine.

A reserve coil can be prepared while previous coil is still being fed into the heading machine. The straightener consists of a car which travels on a track frame. The two drums holding the wire coils can revolve on a shaft held stationary in a spindle head mounted on the car.

The device is operated by placing the butt end of the wire in the gripping bars which grip it hydraulically. The car holding the coil then moves the length of the track, thus straightening a long length of wire. After straightening, the grip bars are released and when the previous coil has been consumed the reel head mounted on the spindle is turned 180° bringing the new coil into operating position. Machine is offered in three sizes. The small model will handle wire having diameters up to ¾ in., the medium up to 1¼ in., and the large model up to 1½ in.



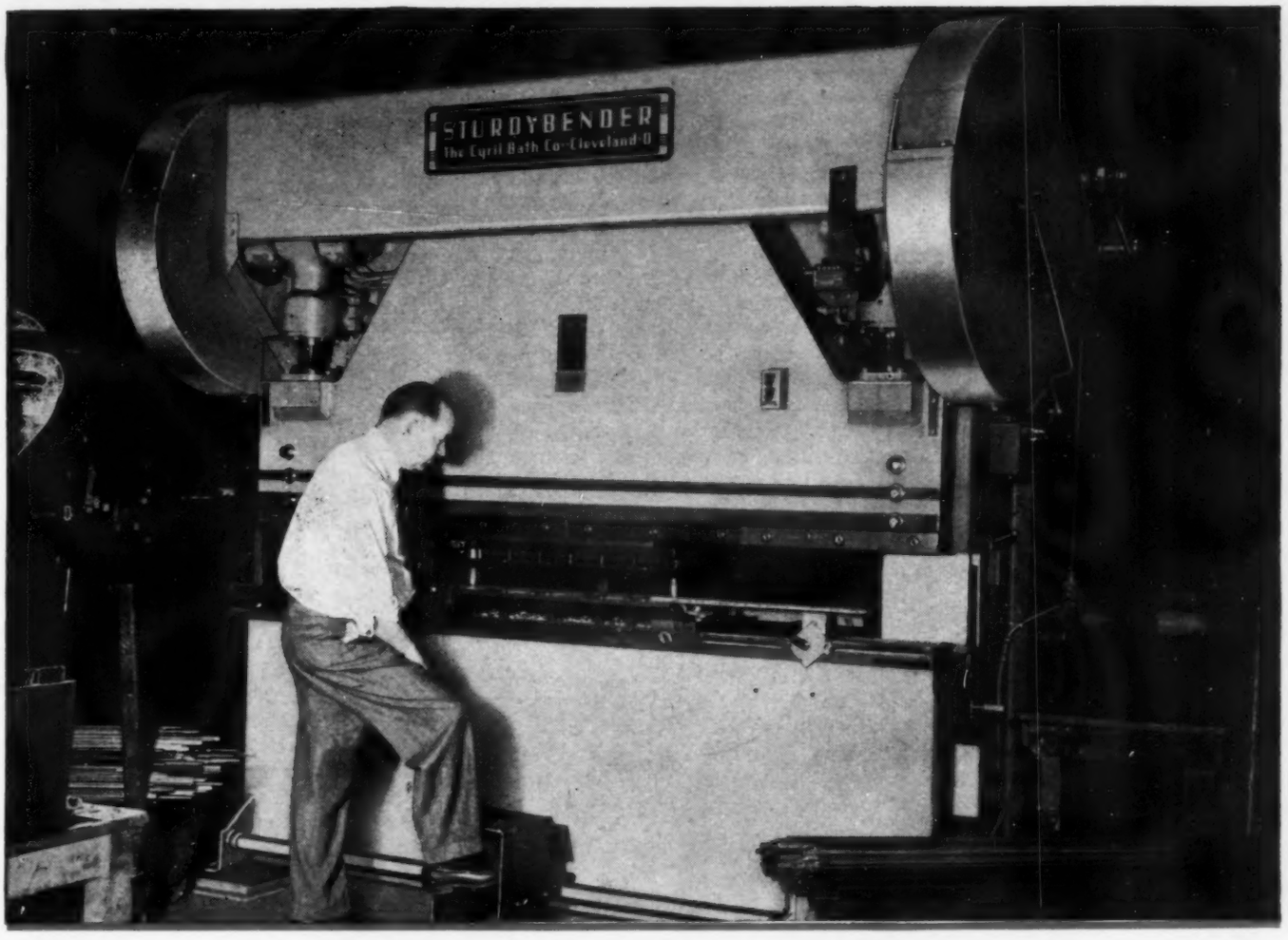
METAL STRETCHER for handling heavy extrusions and for stretch-forming sheet metal, is made by Hufford Machine Works, Redondo Beach, Calif. The basic stretch-forming process consists of gripping a sheet of metal or a rolled or extruded section at each end in suitable jaws and stretching and wrapping over a die made to the required contour



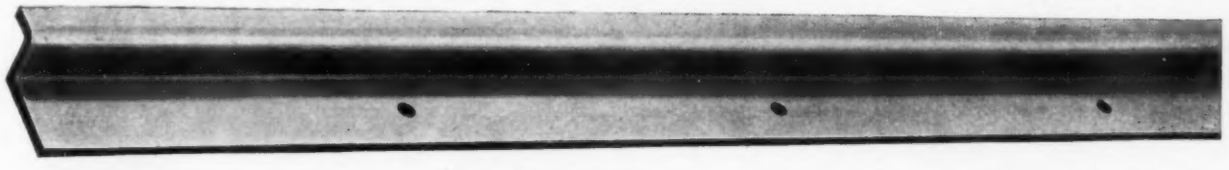
Red Ring Gear Checking Head Determines Helix-Angle Wobble

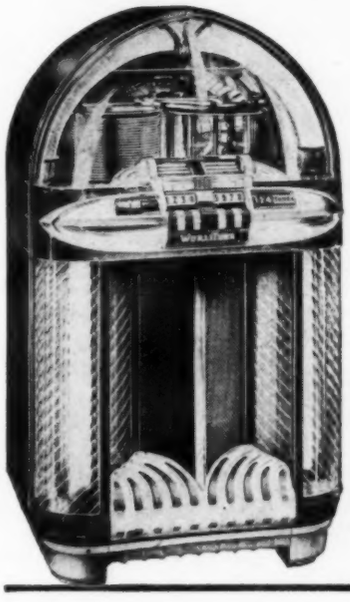
National Broach and Machine Co., 5600 St. Jean Ave., Detroit 13, Mich., offers a checking head designed to determine the helix-angle wobble of a gear, its size, eccentricity, and roughness of roll simultaneously or separately, by rolling the work gear with a master gear under predetermined pressure. Either conventional or 90° drive gears can be checked by this method.

AUTOMATIC PARTS WASHER is made by the Protectoseal Co., 1920 S. Western Ave., Chicago 8, Ill. Called the Air-Matic, the washer offers fire protection in the use of flammable cleansing solvents. The Air-Matic is compact and portable. Washing is done by moving the perforated basket with contents up and down through the solvent. A reciprocating air engine is used eliminating sparks that might ignite flammable vapors. The washer will operate on any compressed-air supply



Longer Pieces—Less Handling—Plus Perforations are STURDYBENDER Advantages *for Rudolph Wurlitzer*





• This is a STURDYBENDER Press Brake in operation at the Rudolph Wurlitzer plant in North Tonawanda, New York. The company reports it enables them to use longer pieces, reduce handling and do perforating operations without time lag.

The Light Shield shown above and used on both sides of the Wurlitzer cabinet, is made of hot rolled steel, S.A.E. 1010, ⅛" thick. Original material comes flat. STURDYBENDER forms the shield and perforates 12-3/16" diameter holes in two stages.

This STURDYBENDER is in operation 12 hours a day, speeding up production of metal parts for phonographs and organs built by the Rudolph Wurlitzer Company. This is but one of hundreds of STURDYBENDER Press Brakes that have proved to be steady profit builders in all types of metal working plants. Write for literature.

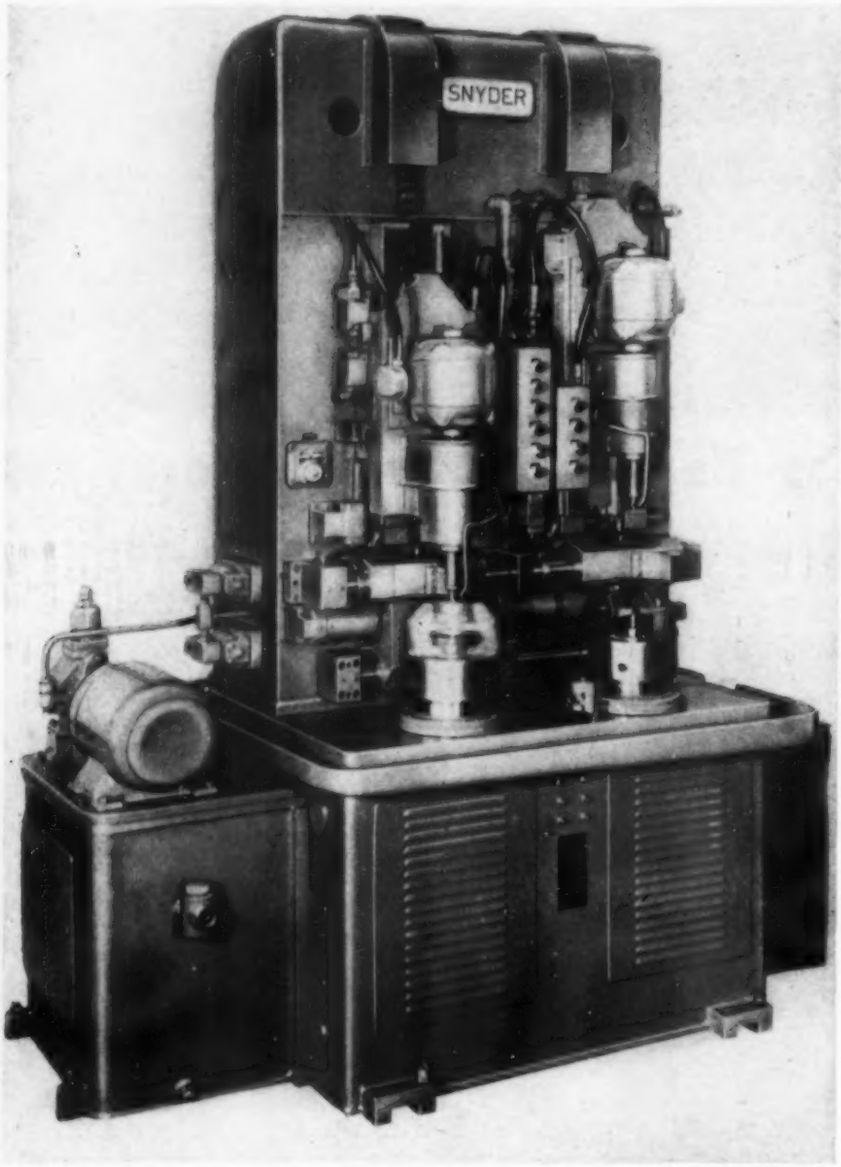
THE CYRIL BATH COMPANY

6910 Machinery Avenue, Cleveland 3, Ohio

Shearcut Blind-Hole Rotary Broach Finishes Holes to the Exact Size

Rotary broaching is a technique developed by Shearcut Tool Co., Box 746, Reseda, Calif., for producing finished holes to exact size. The process is a true broaching operation, but unlike the conventional broaching tools the rotary broach produces a true shear-cutting action, using end pressure and rotation of the tool or work as it is fed into the work.

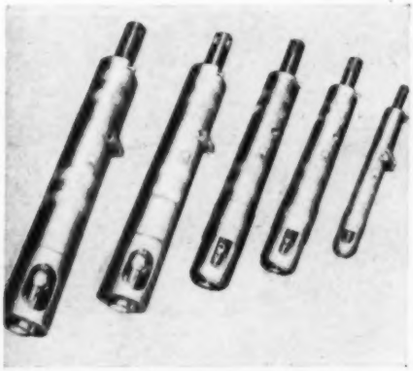
Designed to replace reamers and to eliminate a second broaching operation, rotary broaches can be used on lathes, turret lathes, automatics, boring mills, milling machines, jig borers, and other machines for the production of holes which can be held to limits of 0.0001 in. The new Shearcutter blind-hole rotary broach features helical cutting flutes which are right-handed. This causes the chips to be fed out of the blind hole and makes it possible to feed the rotary broach to the bottom of the hole. Standard stock sizes are available from 3/16 to 1 in. in increments of 1/32 in. From 1- to 1½-in. stock sizes are available by 1/16th-in. increments.



CENTER DRILLING and facing automotive pistons is done on a special-purpose machine designed and built by Snyder Tool & Engineering Co., Detroit, Mich. The machine enables unskilled operators to process 444 pistons an hour at 85 percent efficiency. Required floor space is 50x44 in. The operation consists of center drilling the head end of the piston and facing a portion of the piston head, these surfaces then serving as locating points for succeeding operations

Magnetic Disk Brake by Stearns For Fractional-Hp. Application

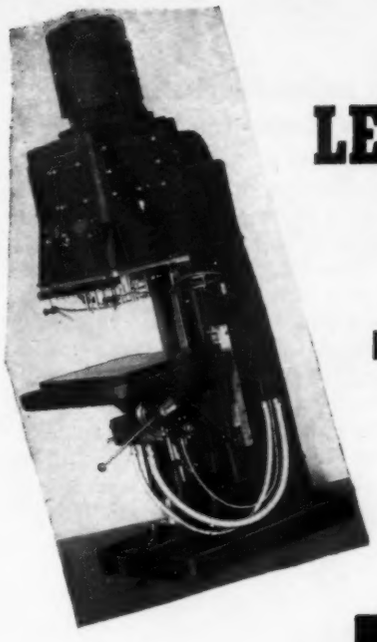
A magnetic disk brake for fractional-hp. application is offered by the Stearns Magnetic Mfg. Co., Milwaukee 4, Wis. This Series X-60 brake is offered for 1/6-, ¼-, 1/3-, ½- and ¾-hp. motors. The housing can be removed without disturbing the operating parts. Straight-line solenoid pull for maximum mechanical efficiency is featured. The brake is offered for continuous or intermittent duty for ac. or dc. and is adaptable for either motor or floor mounting.



Keller Line of Airfeedrills Offered for Multiple Drilling

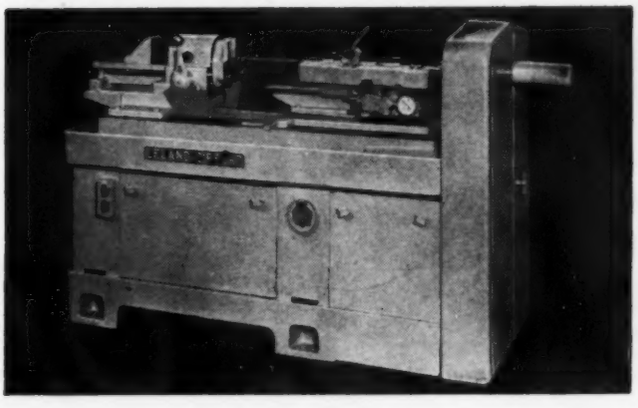
A line of Airfeedrill units made by Keller Tool Co., Grand Haven, Mich., is offered for multiple-drilling operations. The line consists of five units resulting in 34 speed combinations of stationary and portable units for drilling holes up to ¾ in. in diameter in mild steel, aluminum, brass, or plastics. Drills are light, weighing from 3½ to 28 lb.

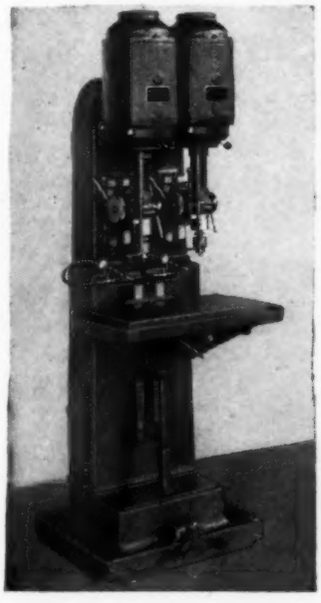
The Airfeedrill is a combination of a Keller air drill and air cylinder, and a hydraulic dashpot and feed control assembled in one housing and arranged for quick-locking progressively in a jig or permanently into a fixture.



THE LELAND GIFFORD LINE

includes a drilling machine
to meet your every need.
Individually motored spindles
Speeds instantly selected
Wide speed ranges





NO. 1 SUPER HIGH SPEED

NO. 2 TO CAPACITY OF NO. 2 M.T.

NO. 3 TO CAPACITY OF NO. 3 M.T.

NO. 4 FOR HEAVY DUTY

. . .

VERTICAL AND HORIZONTAL

DEEP HOLE DRILLING MACHINES

16 SPINDLE ADJUSTABLE

LELAND-GIFFORD

WORCESTER 1, MASSACHUSETTS, U. S. A.

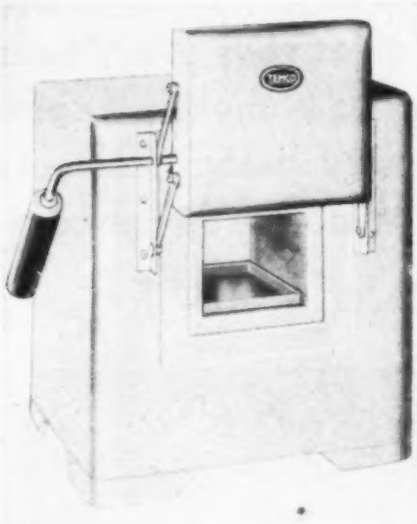
Microfilming Camera by Diebold Films Tracings While in Motion

Diebold, Inc., Canton, Ohio, introduces the Flofilm 42-in. microfilming camera designed to microfilm large or long tracings or maps while the copy is in motion. Listed as the 90-05 triple-purpose Flofilm camera, the machine can be used as a flow camera, flow enlarger, or continuous-flow printer.

Either 16-mm. or 35-mm. film can be used. Feeding speeds can be set at either 30 or 60 fpm. The camera will accommodate copy up to 42 in. wide of any length.

Portable 6-in. Pla-Chek Gage Checks Gages, Dies, Small Jobs

A portable 6-in. Pla-Chek gage designed for checking of small jobs has been announced by Cadillac Gage Co., 20315 Hoover Road, Detroit 5, Mich. The Pla-Chek gage is applicable for checking of gages, tools, and dies, either on the surface plate or at the machine. It is self-contained. Accuracy is said to be to 0.00005 in.



Electric Heat-Treating Furnaces For Carbon, High-Chrome Steel

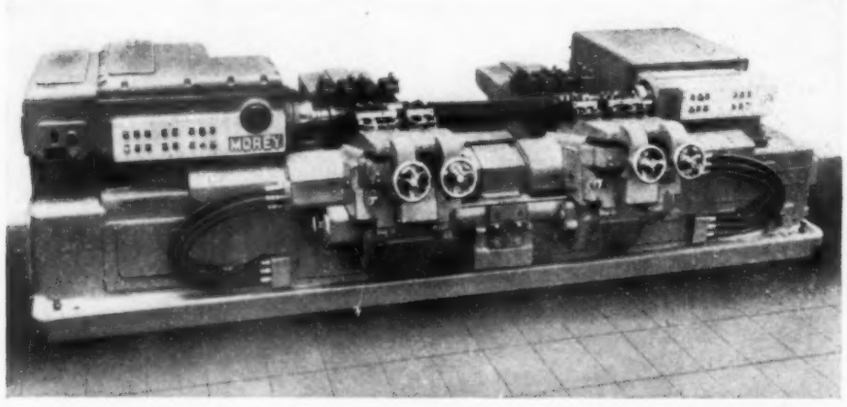
A line of bench-type Temco electric furnaces, for laboratory uses, and heat-treating of carbon and high-chrome steel parts and tools, is offered by Thermo Electric Mfg. Co., 461 W. Locust St., Dubuque, Iowa.

Designated as Series 1500, 1600 and 1700, there are six sizes ranging in chamber dimensions from 4 in. wide, 3½ in. high and 4½ in. deep, to 8½ x 7½ x 18 in. Furnaces can be operated to 1650 F. for continuous use, and to 1900 F. for short periods.

Small Surface-Roughness Scale Gives Comparison by Sight, Feel

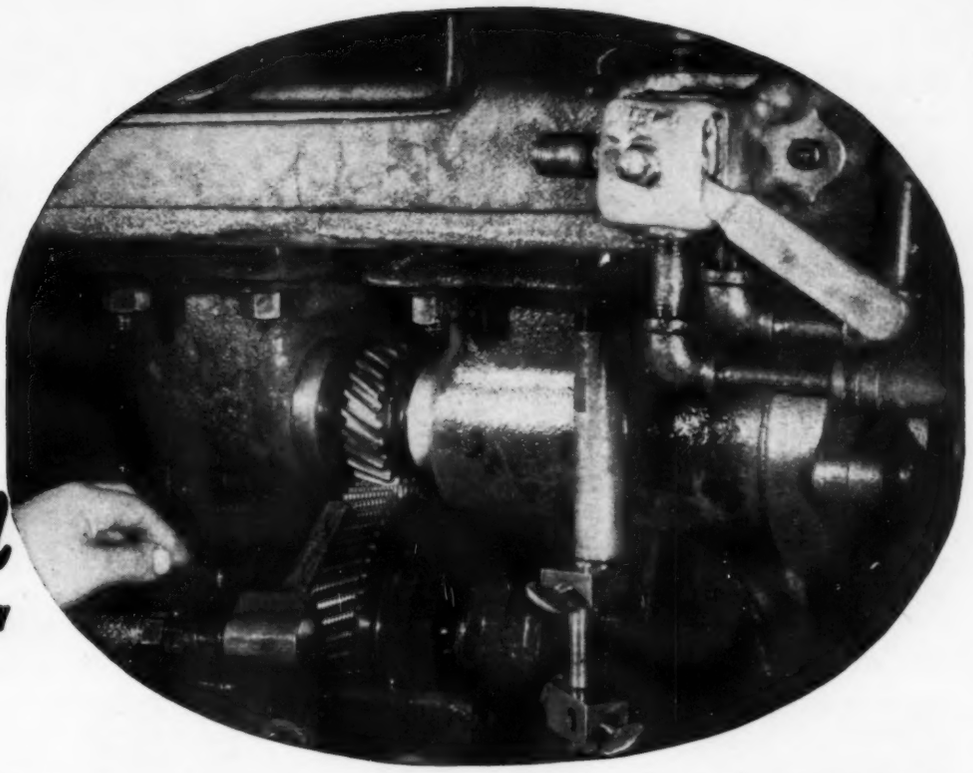
A pocket-size surface-roughness comparator for comparison, by sight and feel, with machine finishes is offered by General Electric, Schenectady 5, N. Y. The surface-roughness scale is composed of two small metal rules 6 in. long and 1¼ in. wide. These illustrate various degrees of roughness ranging from the smoothness of a bearing surface to the roughness of a flame cut. One side of each scale is divided into 12 surfaces, giving a total of 24 different surfaces which are grouped into ten degrees of surface roughness.

FORK TRUCK, made by the Tract-R-Lift Corp., 605 N. Aberdeen St., Chicago, Ill., is a compact gas-powered truck having a 2000-lb. capacity at 24 in. from heel of fork. Truck measures 28x61x60 in. and weighs 3050 lb. Turning radius inside is 6 in.; outside, 67 in. Maximum fork height with 5-ft. mast is 84 in.; with 7-ft. mast, 108 in. Mast has 5° tilt forward and 10° tilt backward from vertical

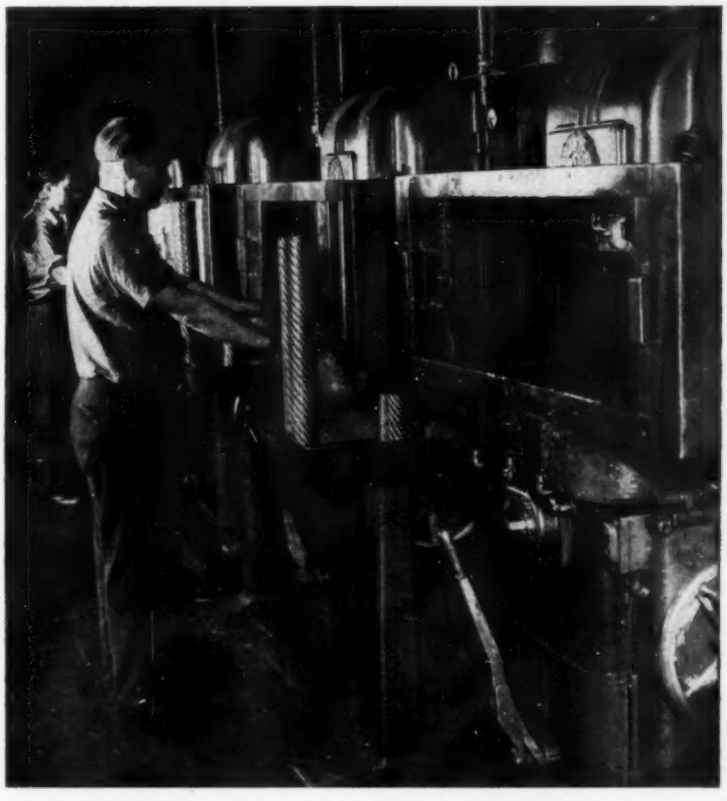


RAILROAD-CAR AXLES are finish-turned on automatic lathes made by Morey Machine Co. Inc., Astoria, N. Y. 2, N. Y. The hydraulically-operated lathes are electrically controlled, and use multiple tungsten-carbide tooling. Wheel seat and journal diameters of railroad axles are produced at a rate from 2 to 3 min. each. Each machine unit and the automatic cycle is controlled by push-buttons. Six adjustable time-delay relays are used in combination with limit switches and control relays for the correct sequence of operation

News for the gear producer



Even faster GEAR SHAVING with LESS operator EFFORT



Two operators easily shave 3368 gears in 8 hours on these four Michigan "Underpass" machines equipped with semi-automatic loading.

Shaving of gears for accuracy and quietness is now so inexpensive and fast an operation on the new Michigan 870 machines that the only practical way to cut time and cost still further, is to cut the effort on the part of the operator.

This has been achieved by the provision of semi-automatic loading, now available on all Michigan Gear Finishing Machines.

In one plant, this development on a MICHIGAN "Underpass" finisher has increased production of timing gears from 920 per operator in 8 hours to 1684 ! !

And the gears are "curved-shaved" (crowned) too, at the same time.

For the story on this, ask for "Information Sheet No. 101-1113."

ORIGINATORS of GEAR-SHAVING

MICHIGAN TOOL COMPANY

7171 E. McNICHOLS ROAD DETROIT 12, U. S. A.

GE Arc-Welding Electrodes For Varied Applications

General Electric, Welding Equipment Division, Schenectady 5, N. Y., offers four electrodes developed for use in a wide range of arc-welding application. They are called Types W-60, W-61, and W-95.

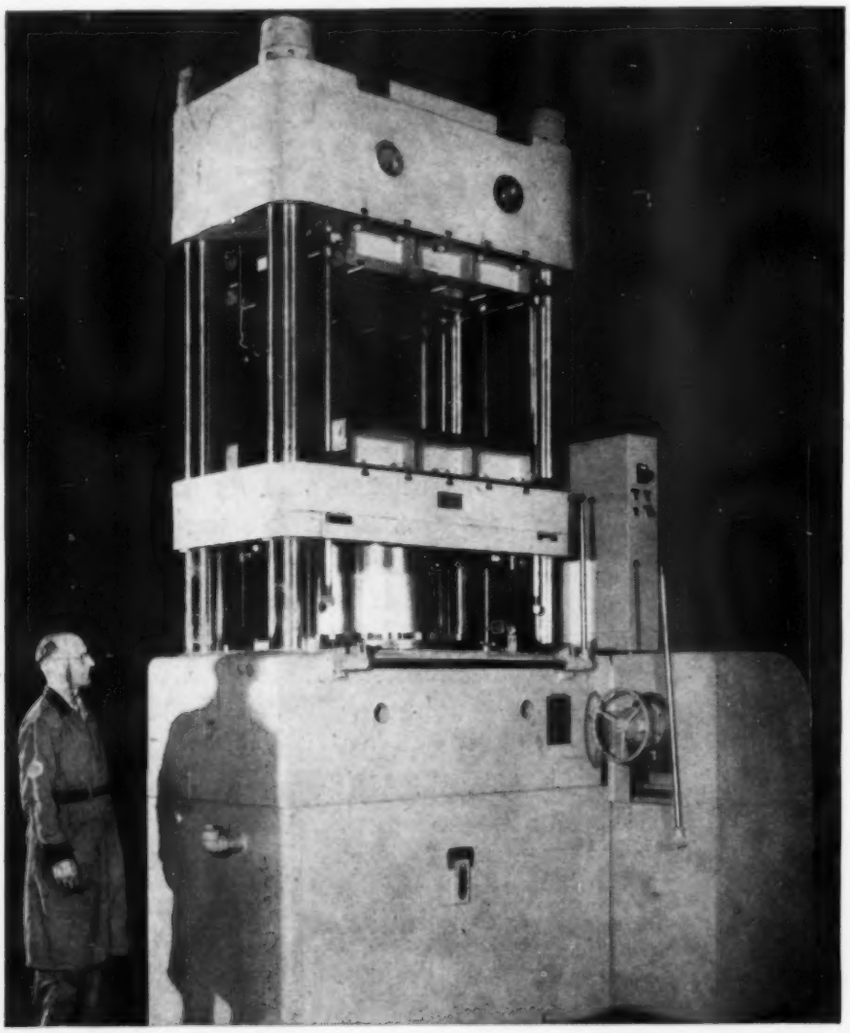
The type W-60 has a low-hydrogen coating and a manganese-moly analysis, and is suitable for welding most hardenable steels where the hazards of under-bead cracking are to be eliminated.

Type W-61 is a low-hydrogen electrode with a moly-vanadium composition, and can be used with either ac. or reverse-polarity dc. to weld a wide variety of low-alloy steels. The type W-62 is low-hydrogen titanium-coated electrode of 2½% nickel composition which can be used on steel castings of a similar analysis, and for producing weld deposits having high impact properties at sub-zero temperatures. For depositing extremely hard wear-resisting weld metal in all positions, the Type W-95 can be used. Either ac. or dc is suitable.

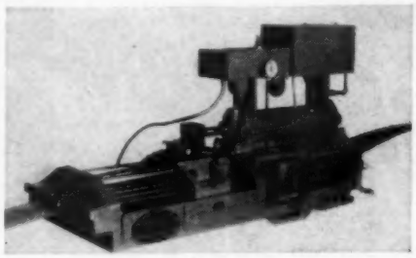
Hard-Facing Electrodes by Lincoln Are the Tubular Shielded-Arc Type

Two tubular-type shielded-arc electrodes, Faceweld No. 1 and Faceweld No. 12, are introduced by the Lincoln Electric Co., Cleveland, Ohio. The tubular-type electrodes provide a higher consistency to the deposited alloy at a lower cost. Electrodes operate on either ac. or dc.

Faceweld No. 1 deposits a chromium-carbide type alloy surface. Faceweld No. 12 is designed to be used where the hard-faced surface must withstand extremely severe abrasion as well as some impact.



PLASTICS MOLDING PRESS with a pressure capacity of 500 tons, is offered by the Hydraulic Press Mfg. Co., Mount Gilead, Ohio. The large-compression semi-automatic press has a maximum mold size of 42x36 in. The daylight between platen and head is 54 in. Maximum ram travel is 26 in. A large upward-acting hydraulic ram has a small internal booster ram, which gives high-speed closing up to 320 ipm.

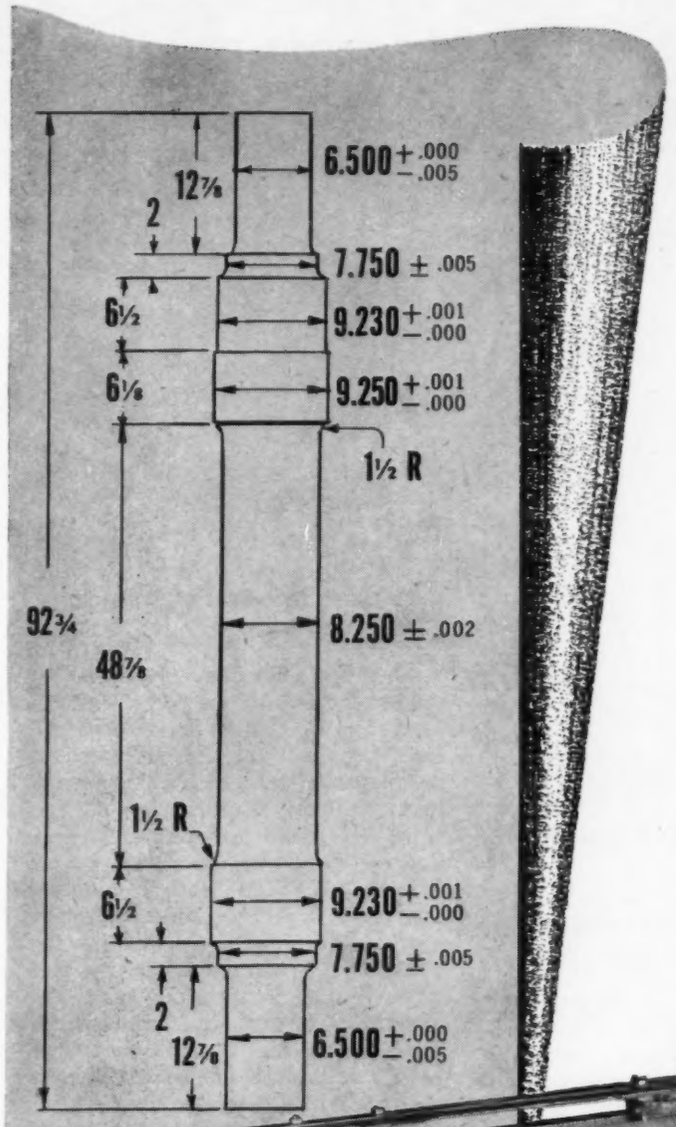


U. S. Air-Operated Slide Feed Needs No Connections from Press

The U. S. Tool Co. Inc., Ampere, East Orange, N. J., offers an air-operated slide feed, a self-contained unit which takes no connections from the press. It can be used on all types of fabricating machines and can be moved from one machine to another. The air feed can be used semi-automatically or can be made automatic by incorporating suitable interlocking switches. Accuracy can be controlled to 0.022 in. at each stroke of the feed.

Portable Electric English Drill Designed for General Production

A ½-in. electric drill has been announced by Fred L. Stuart, 309 E. 40th St., New York, N. Y., United States representative for S. Wolf & Co., Ltd., London, England. The drill is a tool for general production and maintenance. Motor frame and gear box are pressure die cast. Gears are nickel chrome, high-frequency heat-treated. Gear spindle bearings are oil-impregnated porous bronze.



How to SAVE 69 MINUTES Every 21 minutes

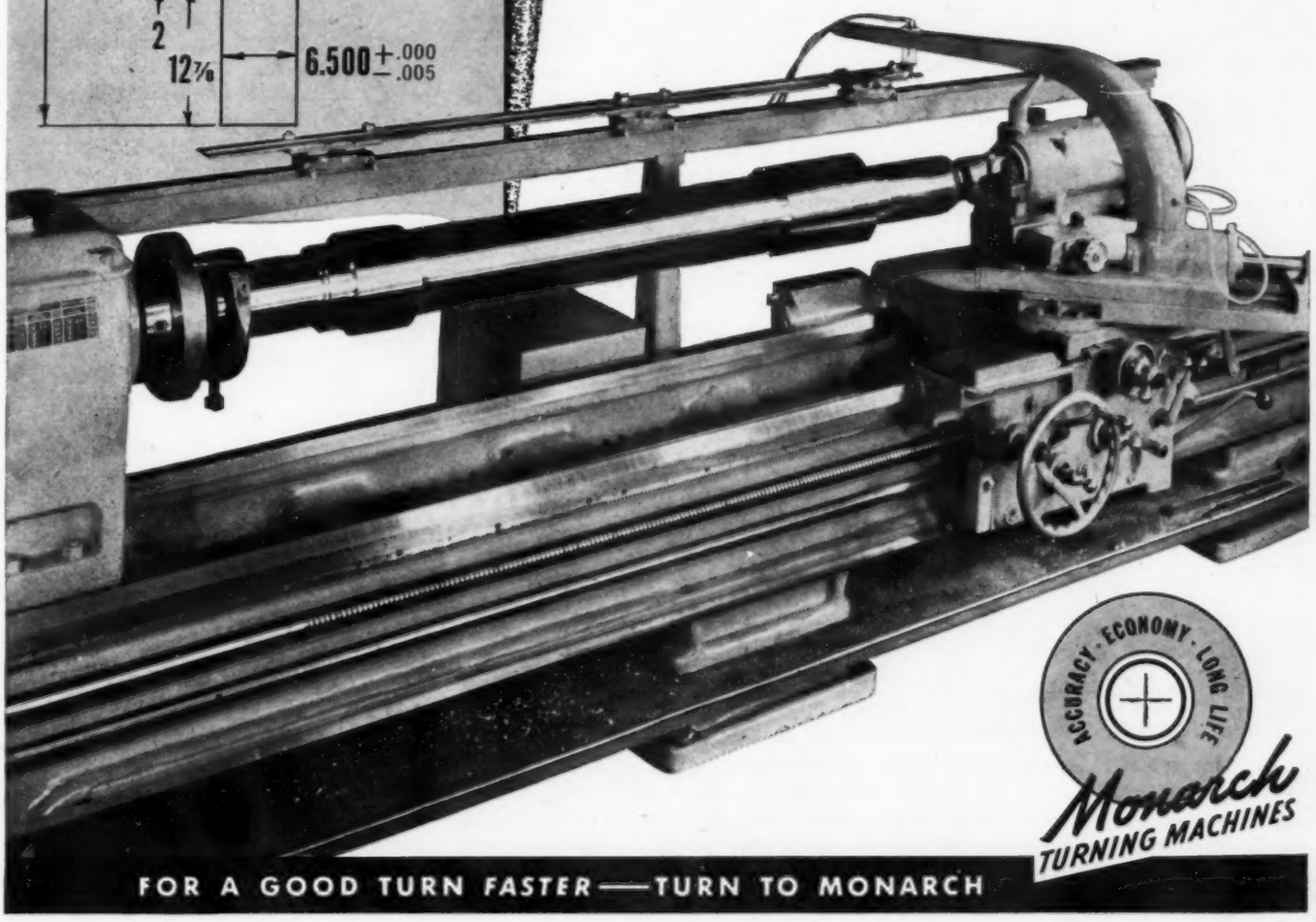
Smooth, stepless, single-point turning of all surfaces from a master template is the secret of such savings in machining time.

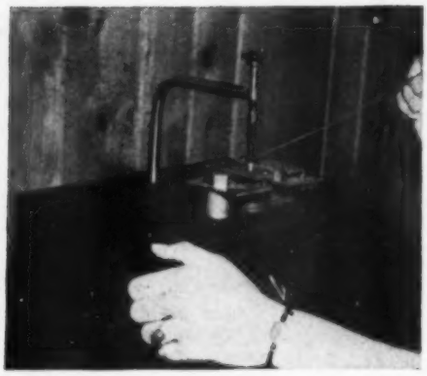
That's the Monarch Air-Gage Tracer turning method—and the 76% saving is characteristic of its regular performance on a wide variety of production jobs—step shafts; contour turning, boring and facing.

The locomotive axle illustrated required 90 minutes to machine with a conventional, manually-operated engine lathe. But the eight diameters to be turned present no such time-consuming problems for Air-Gage Tracing. In spite of the workpiece size, in spite of the unusually accurate results required, turning time is cut to 21 minutes.

That's a typical Air-Gage Tracer example of the saving to be expected on machining time. But there are other savings, too. On all Air-Gage Tracer jobs, setup times are reduced. Frequently, second operations are eliminated. And automatic turning permits one operator to handle two machines—*easily*. Original equipment costs are lower—as are tool maintenance charges. Best of all, Air-Gage Tracing is equally applicable on large lots or small, big parts or little. The method is versatile enough to meet every type of production need. Like more facts? Ask for bulletin 2604.

THE MONARCH MACHINE TOOL CO., SIDNEY, OHIO





DIAMOND DISK WHEEL, made by K-E Industries, 235 Plymouth Bldg., Minneapolis 2, Minn., features a replaceable diamond face. It can be used on ordinary bench grinders as well as carbide-tool grinders. Also offered is the Qualiset diamond setter, illustrated, which operates at 110-v. ac. circuit, and is capable of setting a diamond in less than a minute

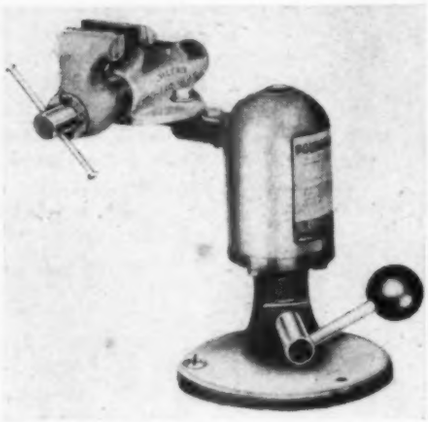
Eutechrom Superhard Welding Rod Overlays Worn, Defective Parts

Eutectic Welding Alloys Corp., 40 Worth St., New York 13, N. Y., offers the Eutechrom welding rod designed as a universal rod to overlay worn or defective parts in cast iron or any kind of steel. The low-heat welding rod Eutechrom 2, (ac.-dc.) is available in sizes of ¼, 3/16 and ⅛ in.

Self-Aligning Die Lifters Are Available in Four Sizes

The Modern Collet and Machine Co., 401 Salliotte St., Ecorse 18, Mich., offers a line of self-aligning die lifters. Units consist of a swiveling eye which accommodates standard lifting hooks and stud assembly for attaching and removing the die lifter. The stud is clamped at proper depth by turning the round notch inside the eye until the collet at the bottom seats against the object to be lifted.

Die lifters are available in four sizes, with maximum lifting capacities of 16, 28, 40, and 100 tons each. Studs are of ¾-, 1-, 1¼-, and 1½-in. diameter respectively and have U.S. Standard threads.



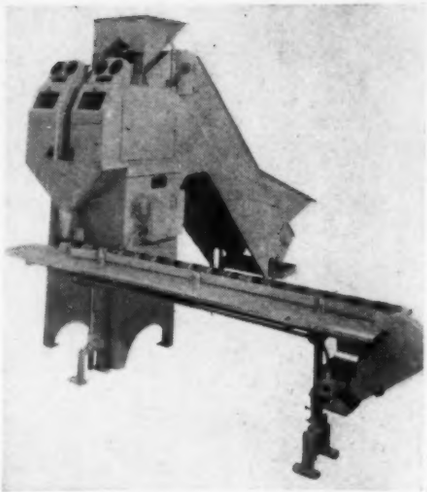
Two Powrarm Units Position And Hold Work Under Pressure

Two improved models of the Powrarm are offered by the Wilton Tool Mfg. Co., 936 Wrightwood Ave., Chicago 14, Ill. One is mechanically operated for light work and the other, hydraulically operated for heavy-duty work. Both Powrarms position work at any desired angle on a 360° horizontal or axial plane, or on a 180° vertical plane, and hold the work firmly under high pressures.

Work up to 150 lb. can be held at any angle. The unit leaves both hands free and eliminates unnatural positions. Finger-tip control exerts pressure up to 6000 psi.

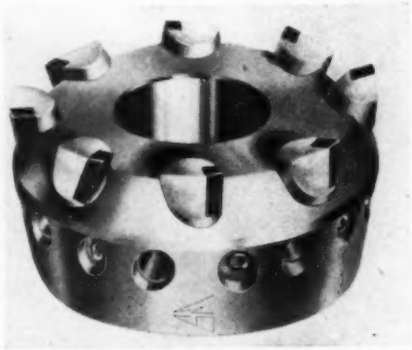
High-Frequency Heater Offered For Controlled and Rapid Brazing

A low-cost high-frequency heater for controlled and rapid brazing, soldering, and heat-treating of metals, is offered by Radio Frequency Corp., Boston 34, Mass. The Model 3000-B produces a powerful magnetic field. Metal subjected to the field heats rapidly in a matter of seconds. The unit has a maximum output of 3000 watts, and lists for $990, complete with tubes, timer, foot switch and power cord. Carbide tips up to ¾ in. can be brazed.



High-Speed Elec-Tri-Pak Weigher Fills Packages of Bolts, Nut

The Triangle Package Machine Co., 906-924 N. Spaulding Ave., Chicago 51, Ill., offers a high-speed Elec-Tri-Pak weigher for handling small metal specialties such as bolts, nuts, washers, and others. The machine is supplied with a low-waist high-rear hopper from which material is drawn by metal-cleated conveyor feed belts. Feed belts intermittently place material as required on the vibratory feed trays which in turn dispense material into power rotated weigh-by buckets. The unit can be used for filling 50, 100 and 1000 pieces of metal specialties in any type container where the weight per discharge does not exceed approximately 3 lb.



Milling Cutter by Wendt-Sonis Embodies Inserted-Tooth Design

The Wendt-Sonis Co., Hannibal, Mo., offers a milling cutter featuring an inserted-tooth design. The cutter, equipped with right-hand cutting blades as standard, can be used as a left-hand cutter by inserting a set of left-hand style blades. The C-arbor mounting is offered for the 6-in. cutter, and direct mounting is featured for the 8-in.

JEWELRY FIRM MAKES LOCK FOR BRIEFCASE

Above: Rexlock for Rexbilt Case, and its parts. Made by the jewelry firm of Augat Bros., Inc., Attleboro, Mass. Many parts of Revere brass.

Rexbilt Briefcase, made by Rexbilt Leather Goods Corp., 151 West 26th St., New York 1, N. Y.

THIS is the story of a briefcase. It has some unusual angles that will be entirely unsuspected by the men who happily tote the case. They would never guess it, but the interesting and quite new combination lock was made by Augat Bros., Inc., Attleboro, Mass. The Augats are manufacturing jewelers, long-time customers of Revere. If those who buy the Rexbilt briefcase think the lock is a jewel, they will be quite right.

Perhaps the Rexbilt Leather Goods Corporation, New York City, really did not have to go to a jewelry maker to have the new Rexlock made with the necessary precision. But you know how people are when they want to offer a really fine product. Fussy. That protects quality. Anyhow, Augat Bros. and Rexbilt are very happy, and so is Revere, for Revere brass is largely used in the lock wherever beauty, reliability and corrosion resistance are important. Some die castings and sheet steels are also used. This, then, is another good example of the wise choice of the proper materials to meet operating conditions, assuring prolonged service and enduring satisfaction to the user. Incidentally, not only is solid brass used liberally in the lock itself, but the handle posts are of the same enduring metal. Thus you have a combination of good metals, good leathers, a good lock idea, to make a quality briefcase . . . . Revere is always glad to collaborate with manufacturers seeking good metals, and welcomes the opportunity to study both new and old applications.

REVERE

COPPER AND BRASS INCORPORATED

Founded by Paul Revere in 1801

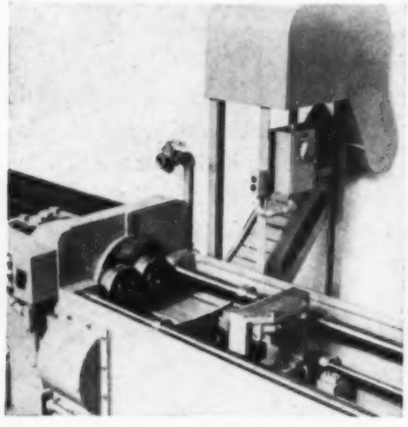
230 Park Avenue, New York 17, New York

• • •

Mills: Baltimore, Md.; Chicago, Ill.; Detroit, Mich.; New Bedford, Mass.; Rome, N. Y. — Sales Offices in Principal Cities, Distributors Everywhere.

Cooley Electric Box Furnace Has Selective Power Modifier

The Model VK-6 electric box furnace has been developed by Cooley Electric Mfg. Corp., 38 S. Shelby St., Indianapolis, Ind. The furnace features a temperature range from 2000 F. to 300 F. permitting hardening and other high-temperature work, as well as low-temperature applications such as tempering or drawing of steels, non-ferrous heat-treating, and others. It has an 8 x 6 x 14-in. chamber. The furnace is furnished with a selective power modifier and a vertical-lift door. Power capacity of this model is 4650 watts.

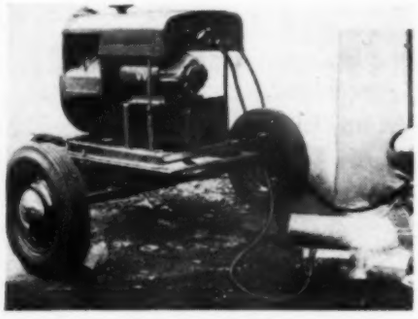


Automatic Handling, Ejection Combined on Broaching Machine

The Colonial Broach Co., Box 37, Harper Station, Detroit 13, Mich., introduces a universal horizontal broaching machine which incorporates both an automatic broach-handling mechanism and a parts ejector conveyor interlocked with the machine cycle. This machine was equipped for handling simultaneously two universal joint yokes. The parts to be broached are placed over the pilot end of the broaches which carry the parts with them into the broaching position against the faceplate.

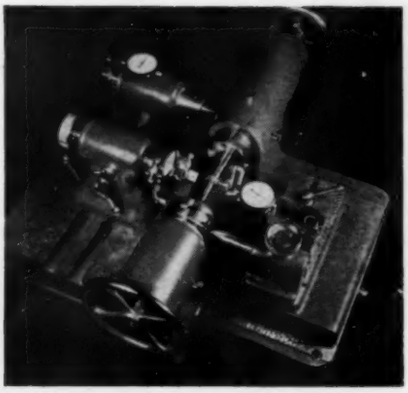
Pallet and Rack Combination Has Capacities Up to 4000 lb.

Material Handling Equipment Co., 30 Church Street, New York 7, N. Y., offers the Uni-Rak multi-purpose pallet and rack combination for high tiering. The combination has capacities to 4000 lb. It fits all standard pallets up to 48x54 in.



GE Lightweight DC Welder Can Be Mounted on Truck

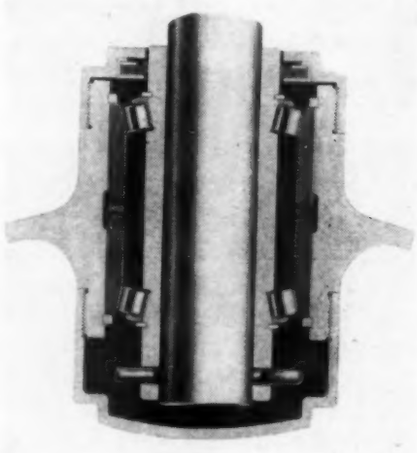
A lightweight, engine-driven dc. welder is offered by General Electric's Welding Equipment Division, Schenectady 5, N. Y. The unit weighs 660 lb. for a maximum of 250 amp. of welding current. It can be transported on a pick-up truck, leaving truck capacity for other equipment. The welder has a built-in auxiliary power outlet of 110 v., for the operation of lights and power tools.



UNIVERSAL GEAR CHECKER, made by the National Broach and Machine Co., 5600 St. Jean Ave., Detroit 13, Mich., handles gears up to 10 in. O.D. The small gear checker checks leads, eccentricity, and both tooth spacing and tooth parallelism. Over-all dimensions are 18x29 in. long

Small-Diameter Eutectic Rod Cuts Stainless Steel, Brass

A small-diameter electrode for cutting thin sheet metal is announced by Eutectic Welding Alloys Corp., New York 13, N. Y. The 3/32-in.-diameter Cuttrode is for cutting stainless steel, bronze, nickel, and copper on small ac. welding machines. The same rod is available in other sizes for cutting heavier metal.



TRUCK WHEELS, which embody a cartridge-type bearing, are offered by The Globe Co., 4000 S. Princeton Ave., Chicago 5, Ill. The radial angular roller bearing combines two important bearing functions at once—radial loading and thrust loading. Called the Duo-Thrust wheel, its bearings are packed with Lubriplate, a water repellant long-life lubricant, at the factory and are guaranteed for one year's use

In addition to the four continuous longitudinal walls, with cross girts at 12″ intervals on sizes up to 20″ and 24″ intervals on the larger machines, Sidney Lathe beds can be equipped with tool steel ways if desired.

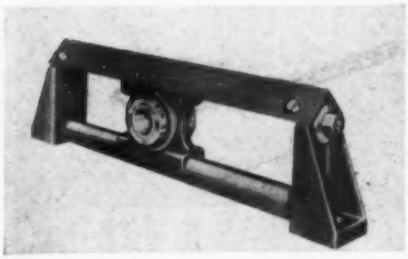
The tool steel ways are ground in place on the machine providing longer life—and dependable accuracy.

This bed design provides three Vees and a flat. The two well proportioned outside Vee Ways take downward thrust and twisting strains and accurately guide the carriage for straight or taper turning and boring.

The end result is greater rigidity—less chance for misalignment and continued accuracy.

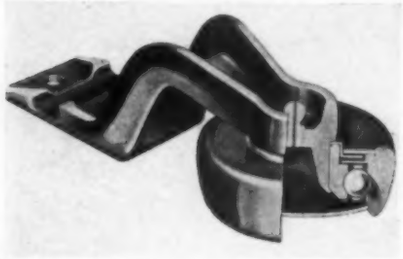
Bulletins on all sizes available

Parts and Materials



Dodge Protected Screw Take-Up For Conveyor, Elevator Service

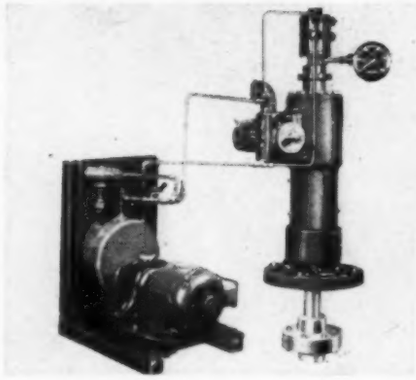
Dodge Manufacturing Corp., Mishawaka, Ind., has developed a roller-bearing protected screw take-up. The type E take-up, illustrated, is said to be rugged in construction and compact in design. Positive adjustment of the take-up is effected by turning screw heads at either end. The Dodge Type H take-up is designed for general conveyor and elevator use. The bearings are babbitted, faced on ends, and equipped with standard pressure fittings. The load on the bearing can be applied in either direction.



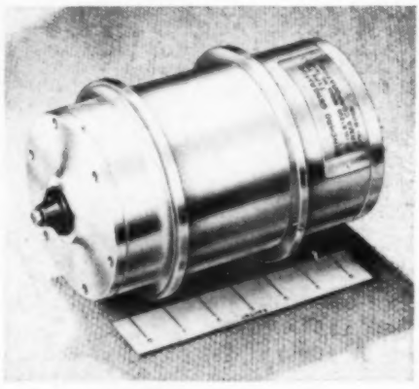
GREASE SEALS on the trolley-wheel bearings of overhead conveyors are said to prevent drip. Made by Jervis B. Webb Co., 8951 Alpine Ave., Detroit 4, Mich., the trolley-wheel bearing is said to retain the lubricant under any operating condition

Line of Manual Starting Switches By GE for Fractional-Hp. Motors

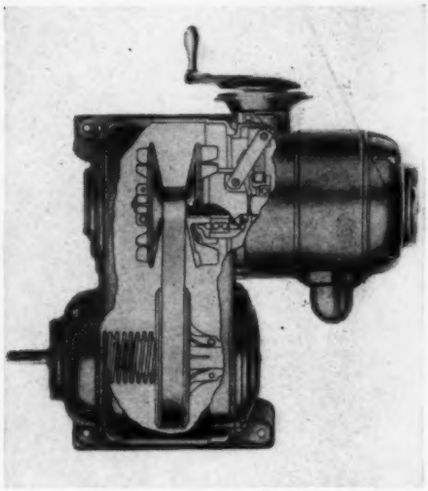
A line of manual starting switches for use with fractional-hp. motors has been offered by General Electric's Control Division, Schenectady 5, N. Y. Switches are available in five types: with general-purpose inclosure; without inclosure; combination unit and selector switch; cast iron inclosure for wet locations; and a similar type for dusty or hazardous locations.



HYDRAULIC-DRIVE SYSTEM is offered by the Hydraulics Division, of Rockwell Manufacturing Co., Pittsburgh 22, Pa. The hydraulic system uses pumps and motors as the hydraulically coupled activating mediums. Motors can be remotely located from pumps. The Hydro-syn governing system can be used to maintain any predetermined condition of speed, torque, pressure, volume or liquid level. Drivers are furnished in speed ranges to 5000 rpm., in ratings to 125 hp. or greater



SYNCHRO UNITS designed for electronic, electromechanical, and electro-hydraulic control systems, and for remote control and indicating purposes, is made by Arma Corp., 254 36th St., Brooklyn 32, N. Y. The line includes control transformers, motors, generators, differential motors, and differential generators



Microspeed Control Is Offered On the U. S. Varidrive Motors

U. S. Electrical Motors, Inc., 200 E. Slauson Ave., Los Angeles 54, Calif., introduces the Varidrive motor enabling a machine operator to obtain infinite speeds. The microspeed control allows any speed from 1 to 10,000 rpm., while the motor is operating.

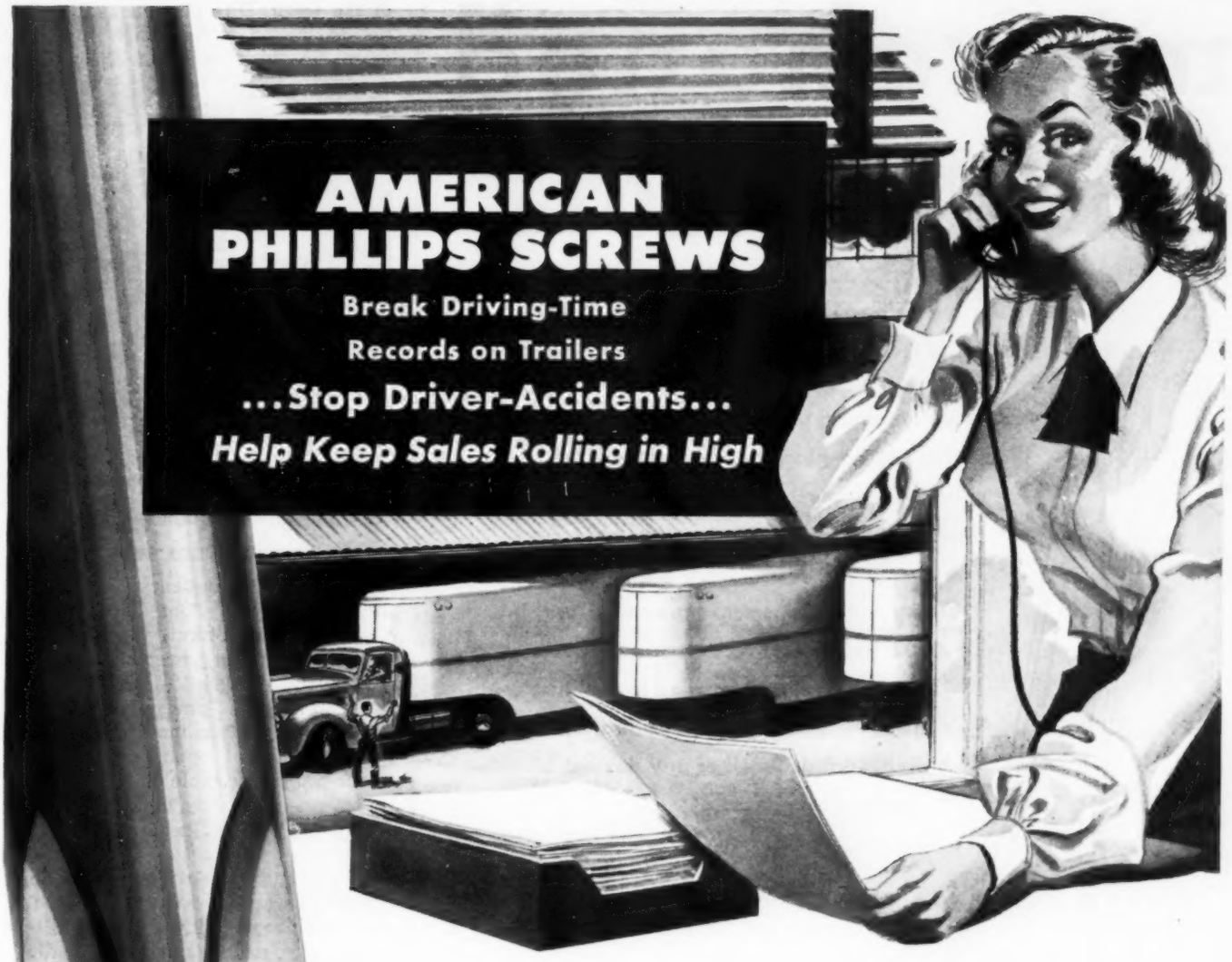
Denfis Pack-Hardening Paste Hardens Only Desired Sections

A method of case hardening that does not require special equipment has been developed by Denfis Chemical Laboratories, 172 Pacific St., Brooklyn 2, N. Y. A pack-hardening paste known as Carburit is applied to the sections of the work to be hardened. The remainder of the work will remain soft.

The work coated with Carburit is heated to 1700 F. and held for the time required to produce the desired penetration. The penetration is rapid, with a 0.040 in. case formed in 25 to 30 min.

After cooling in air, the work is reheated to 1500 F. The paste is then knocked off and the work quenched.

Carburit can be used with any method of heating. When a furnace is not available the work can be heated in an open forge with temperature gaged visually by the color



AMERICAN PHILLIPS SCREWS

Break Driving-Time Records on Trailers

...Stop Driver-Accidents...

Help Keep Sales Rolling in High

FASTEN FASTER with American Phillips Screws . . . the way plywood panels are fastened to trailer frames . . . with power drivers. *One man takes only 32 minutes to drive 522 screws*! That's 50% faster than slotted screws, with half the labor. And there are no corners too close . . . no angles too awkward. No costly accidents to workers or their work.

SELL FASTER . . . Buyers of *all* types of products are learning to recognize this "high sign" of quality construction . . . the American Phillips Screw with the universal cross-recess. Just tell them the whole story of American Phillips strength and vibration-resistance . . . and watch sales pick up speed! Write.

AMERICAN SCREW COMPANY, PROVIDENCE 1, RHODE ISLAND

Chicago 11: **589 E. Illinois St.** *Detroit 2:* **502 Stephenson Building**

4-WINGED DRIVER CAN'T SLIP OUT OF PHILLIPS TAPERED RECESS

AMERICAN PHILLIPS *Screws*

ALL TYPES

ALL METALS: Steel, Brass, Bronze, Stainless Steel, Aluminum, Monel, Everdur (silicon bronze)

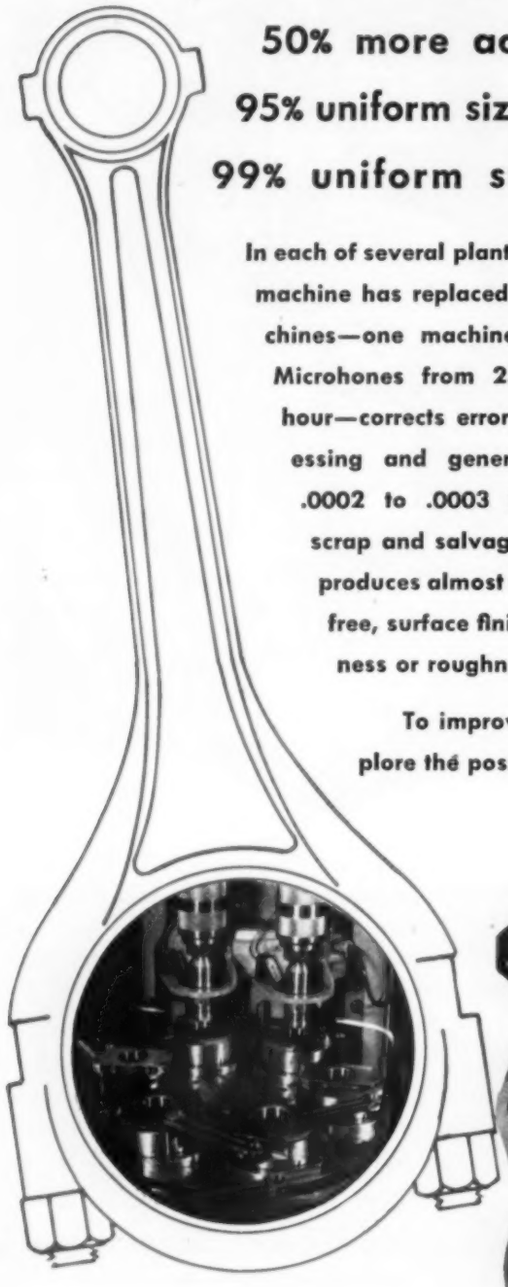
microhoned*

for: 20% to 40% more production

50% more accurate bearings

95% uniform size, fewer re-runs

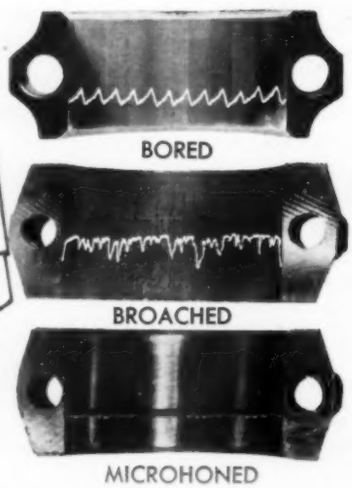
99% uniform surface finish



In each of several plants, one microhoning machine has replaced three grinding machines—one machine and one operator Microhones from 250 to 400 rods per hour—corrects errors from previous processing and generates accuracy within .0002 to .0003 inch—reduces oversize scrap and salvage re-runs to within 5%—produces almost perfectly uniform, chatter-free, surface finish of any desired smoothness or roughness.

To improve your production, let's explore the possibilities now.

Six-station fixture for Microhoning two connecting rods simultaneously.



Comparison of Profilograph records of typical connecting rod machining operations.

* TRADEMARK REG. U. S. PAT. OFF.

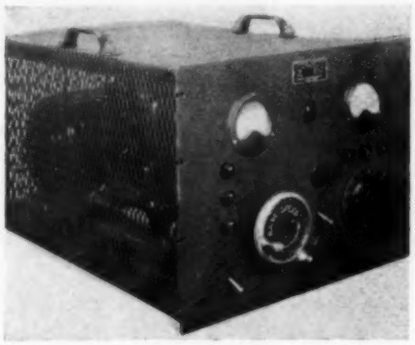
MICROMATIC HONE CORPORATION

8100 SCHOOLCRAFT AVENUE, DETROIT 4, MICHIGAN

DISTRICT FIELD OFFICES:

1323 S. Santa Fe, Los Angeles 21, California
616 Empire Bldg., 206 S. Main St., Rockford, Ill.
55 George St., Brantford, Ont., Canada
Micromold Manufacturing Div., Boston Post Road, Guilford, Conn.

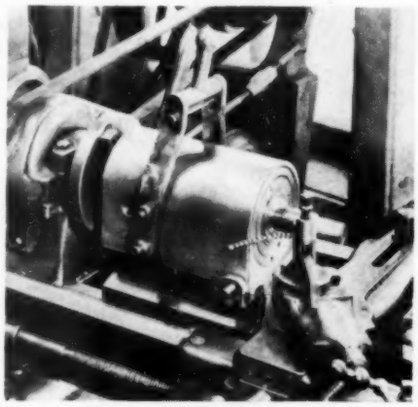
of the work. The paste is said to be non-toxic and to be easily removed from the work and from the hands. The price is $15 for 1 gal. and $10 per gal. for five gallons or more.



Custom-Built Frequency Converter For Special Synchronous Motors

Custom-built frequency converters are offered by Polar Engineering Co., 313 Main Street, (Rear,) Danbury, Conn. The power supply illustrated was designed to give a source of three-phase power to operate small synchronous motors of special design. It will operate on 220 v., three-phase, 60 cycle input, with an output continuously variable in both frequency and voltage over a wide range.

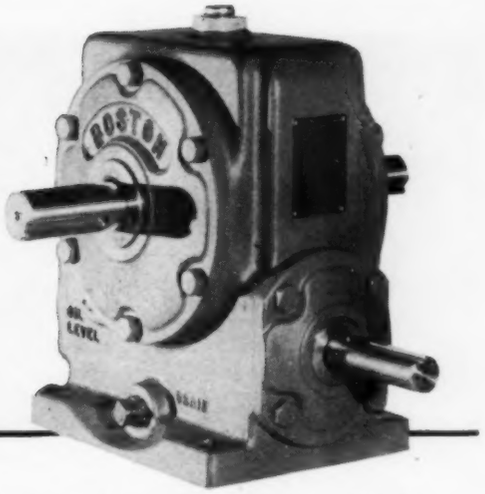
Frequency regulation is dependent upon the speed regulation of the induction-motor drive. The built-in frequency meter gives true indication of the generated frequency. Converters can be used in laboratory and production test work on variable-speed tools, high-frequency motors, and various circuit-analysis problems.

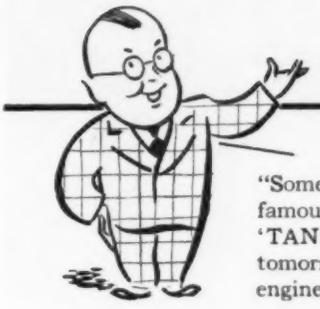


Collet Speed Chuck by Zagar Rotates on Its Own Bearings

The Model B collet speed chuck is offered by Zagar Tool, Inc., 23880 Lakeland Blvd., Cleveland 17, Ohio. This chuck rotates on its own bearings and derives its turning power

Good News FROM BOSTON!





"Something new has been added to Boston Gear's famous line of Ratiomotors and Reductors. Meet 'TAN' . . . the speed reducer that's as modern as tomorrow . . . brand new design . . . most advanced engineering features on the market!"

Get these five big advantages—

- **Higher Power Rating . . .** heavier gearing and larger shafts permit greater loads.
- **Greater Ruggedness . . .** worm is integral with its shaft for increased strength and reduction in number of parts.
- **Better Heat Dissipation . . .** one piece, streamlined housing results in cooler running . . . longer life.
- **Improved Oil Seals . . .** leakage minimized with low-friction seals.
- **New Vent Valve . . .** new combination oil filler plug and vent valve permits unit to "breathe" . . . keeps out dust and dirt.

Except for shaft sizes, the new "TAN" Reductor is completely interchangeable with the present "TAN" unit which it replaces. Has same shaft centers and mounting dimensions.

NOW! Immediate Delivery . . . From Stock

"Yes, you can buy most popular types of Boston Reductors right off the shelf — just order *genuine high-quality Boston Reductors* by catalog number. Send for free bulletin on new "TAN" Reductor — ask for Catalog #54 on the complete Boston line including Ratiomotors and Reductors."

Here's the complete line of Boston Ratiomotors & Reductors—16 different types to select from!

FREE Get This Bulletin On New BOSTON "TAN" Reductor!

Name ..... Position .....

Company .....

Address .....

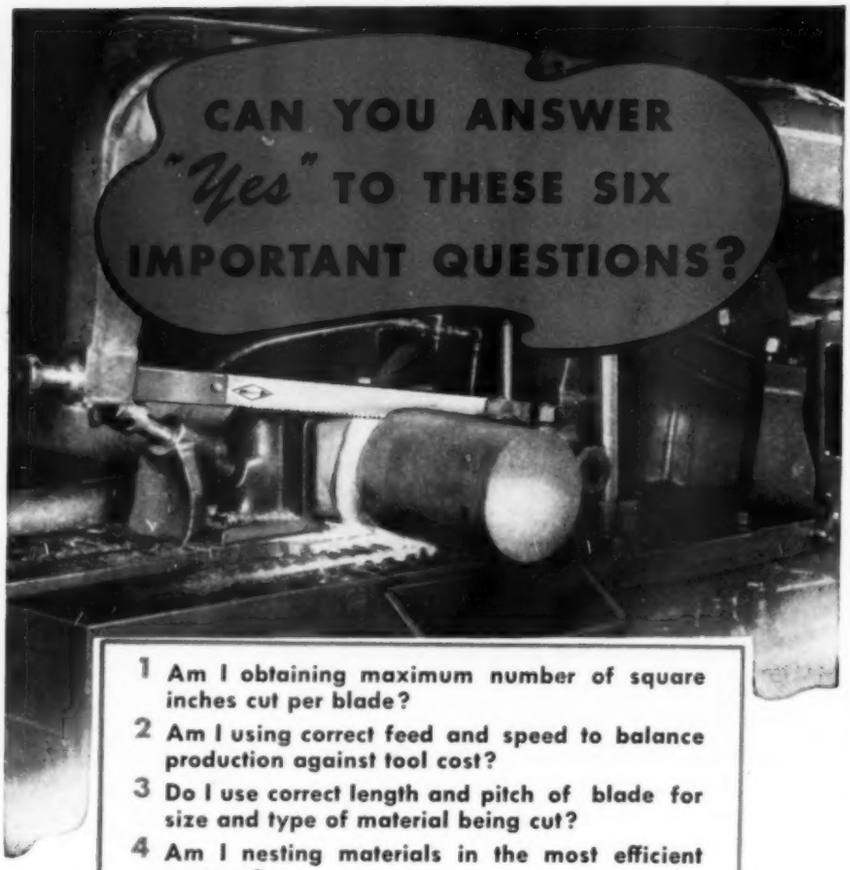
City ..... Zone ..... State .....

☐ Check here for free copy of Boston Gear's complete Catalog #54.

BOSTON GEAR WORKS

63 Hayward Street, Quincy 71, Mass.

One of the world's most complete lines. 72 Distributors in major cities.



1 Am I obtaining maximum number of square inches cut per blade?
2 Am I using correct feed and speed to balance production against tool cost?
3 Do I use correct length and pitch of blade for size and type of material being cut?
4 Am I nesting materials in the most efficient manner?
5 Am I cutting my material in the shortest possible time consistent with normal blade life?
6 AM I USING THE RIGHT BLADE?

If you can answer "yes" to all six, then you can be sure that your production hack saws are operating most efficiently. If you cannot, then Barnes is ready to match its top quality hack saw blades plus its knowledge of metal sawing against your cutting problems.

Barnes Service Engineers can give you the correct answers to all of these questions. With their help and with Barnes Blades on the job, you will be assured that your production power hack saws will deliver maximum cutting efficiency. Your Barnes Distributor will have a Barnes Service Engineer call on you whenever you say—no obligation.

The Barnes Hack Saw Production Calculator, with valuable information on metal cutting, will also help you get the most from your power hack saw. It's free on request; just write on your letterhead today. We'll be glad to send it to you.

BARNES
Established 1919
W. D. BARNES CO., INC.
1297 TERMINAL AVE. · DETROIT 14, MICH.

from the spindle of the machine to which it is attached. By the elimination of overhang heavier work can be done. The chucks are designed in 1- and 2-in. through capacities and they are being made to order to suit any type of lathe, grinding machine, or other rotating spindles.

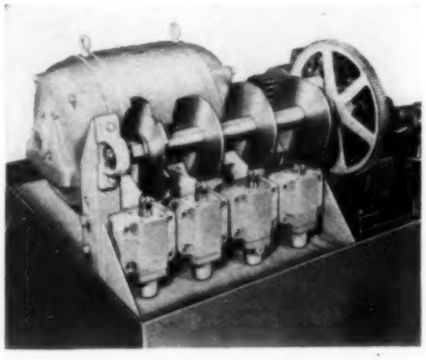
Krylon Transparent Plastic Spray Resists Rust, Tarnish, Corrosion

A plastic spray which resists rust and tarnish is offered by Foster & Kester Co. Inc., Philadelphia, Pa. Called Krylon, the transparent plastic coating is supplied in a self-contained compact sprayer. The spray is released by pressing a button on the top of the can with the index finger.

The coating is said to dry in less than a minute leaving a clear satin finish that retains the flexibility of the material on which it has been applied. Krylon is said to resist discoloration at high temperatures, water, alcohol, alkalies, acids, and other materials.

High-Tension Conveyor Belt Incorporates Rayon and Nylon

A high-tension fabric conveyor belt called Raynile is offered by the Hewitt Rubber Division, Hewitt-Robins, Inc., Buffalo 5, N. Y. Belt is offered for jobs where belt tensions run as high as 1000 lb. per in. of width. The woven fabric is a combination of rayon and nylon. Maximum tensions are said to be almost double of that offered by 48-oz. cotton fabric.



Mechanical Brain by Hufford For Timed Repetitive Motions

Hufford Machine Works, Inc., Redondo Beach, Calif., offers the Hufford Mechanical "Brain". Adaptable to various types of hydraulic equipment, it produces a series of timed repetitive motions to multiple-ram installations utilizing hydraulic cyl-

This prescription raised production 50%

Vitamin "C"?—Carboloy Cemented Carbide, of course.

It was a Carboloy engineer who turned the trick. Here's the story:

On installing a new boring machine recently, a small plant in Pennsylvania was sadly disappointed to get no better production from it than they had from the old one. So they called in a Carboloy engineer.

Now? Thanks to his suggestions, the new machine is turning out half again as many pieces—twelve cast-iron wheels an hour instead of the previous eight.

Why was he able to help them? Here's the reason: Carboloy engineers spend most of their time working with Carboloy Cemented Carbides. They've come up against almost every type of carbide problem you can imagine, in their time. They're experts—specialists in carbides.

Try this prescription yourself!

You, too, can back up the intimate knowledge of your own production men with this specialized "know-how" of Carboloy engineers. They can bring to your plant a broad experience in obtaining maximum results with carbides.

Slight changes in tool design, speeds or feeds, grinding, or tool handling often effect far reaching economies and increases in out-put.

Together, your engineers and our Carboloy specialists can form a team nothing can stop. Together they can use carbides to cure many of your production ills.

Ask for your Carboloy engineer

Your Carboloy engineer will be glad to help you with your carbide problems; or in the selection of the most economical tooling from any of Carboloy's 600 standard tools and blanks, or special Carboloy-tipped tools made by more than 150 tool manufacturers.

Why not call your Carboloy engineer? Or write us direct: Carboloy Company, Inc., 11149 E. 8 Mile Road, Detroit 32, Michigan.

Standards stocked by authorized distributors in 82 cities coast to coast.

CARBOLOY®
CEMENTED CARBIDE

WHEN Firth-Vickers of England signed their reciprocal agreement with Lebanon of U.S.A. for a complete exchange of ideas, information and foundry practices, it meant a lot to you.

For now you can have the advantage of the best in alloy castings which has been developed *both* in this country and in Europe.

Of great importance is the "centri-die" process of making centrifugal castings in permanent molds. Firth-Vickers developed this process to make possible the Rolls Royce, De Havilland and other jet engines. Here at Lebanon we are finding applications not only for airplane engines but also in equipment for the oil, chemical, paper and pulp, mining and other industries where corrosion and heat make service conditions severe.

When you talk to Lebanon about alloy castings you *know* you are talking to experts with a wealth of information available.

LEBANON STEEL FOUNDRY • LEBANON, PA.

"In The Lebanon Valley"

The Agreement between Firth-Vickers Stainless Steels, Ltd., Sheffield, England and the Lebanon Steel Foundry, Lebanon, Pa., U.S.A. provides for complete exchange of metallurgical and engineering data, and foundry techniques and practices. This understanding between Lebanon and the largest producer of alloy castings in Europe pools the technical knowledge and experience of both sides of the Atlantic for your benefit.

Write now for this FREE BOOKLET "Centri-die Centrifugal Castings"

Here is a clear explanation of the practical advantages to you of the Firth-Vickers Centri-die method of making alloy castings centrifugally in permanent molds. Of interest to executives and engineers who want to keep abreast of new manufacturing and production methods. Write for Bulletin D.

LEBANON *ALLOY AND STEEL* Castings

CIRCLE L

inders. The brain employs a series of specially designed cams which are machined for specific operations. These cams are mounted on a single shaft which is motor-driven through a hydraulic transmission. Variation of speed is infinite over the desired range.

Motor-Mounted Collet Chuck Will Serve as a Simple Lathe

Goodwin Mfg. Co., Cuyahoga Falls 1, Ohio, offers a motor-mounted collet chuck which serves as a low-cost lathe. The lathe is used for secondary operations such as deburring, filing, and polishing. A spring ejector can be provided to speed production work. The chuck body is made in two parts to facilitate accurate mounting, and is said to run true on the motor shaft without wobble.

The chucks are available in two sizes: the 1-in. capacity models fit motors having up to 1½-in. shaft diameter. The chuck has a 3½-in. O.D. and an over-all length of 3⅛-in. The 2-in. capacity model has 5½-in. diameter and 2⅞-in. overhang and will fit any shaft up to 3⅜ in. in diameter.

High-Temperature Thermoplastic Resists Corrosive Gases, Liquids

Kel-F, a stable high-temperature thermoplastic, has been announced by the M. W. Kellogg Co., Jersey City, N. J. In its natural state, Kel-F is colorless and transparent, although it can be blended with solid fillers and coloring agents. No effect is said to have been observed after prolonged exposure to concentrated sulphuric, hydrofluoric, and hydrochloric acids. Pump packings, valve seats and other applications where corrosive gases and liquids are proc-

Just what is meant by

STAINLESS

?

Some 30 alloy steels, each identified by its American Iron and Steel Institute number . . . able to thwart attacks by chemicals and atmospheres over a wide range of concentrations, pressures and temperatures...carry the family name "Stainless."

The addition of chromium in excess of 11% to steel provides, according to most generally accepted theory, a thin, adhering self-healing oxide film that protects the underlying metal. The result is a series of alloys highly resistant to corrosion and tarnishing in a wide variety of corrosive media.

Six per cent or more of nickel when added to chromium stainless steels produces a series of alloys of improved corrosion resistance known as the austenitic chromium-nickel stainless steels. Recognition by industry of this improvement is indicated by the fact that approximately two-thirds of all stainless steel tonnage produced is of the chromium-nickel type.

In the annealed condition austenitic chromium-nickel stainless steels are strong, tough, ductile and pliable. When cold-worked they are effectively strengthened and hardened; a tensile strength in excess of 200,000 p.s.i. is easily developed. Annealed, and even in the cold-worked condition, they are adaptable to many forming operations. In all conditions they are readily weldable.

At elevated temperatures, austenitic chromium-nickel stainless steels are distinguished by their strength and outstanding resistance to oxidation. At temperatures down to −300° F. they retain their toughness and unusual strength.

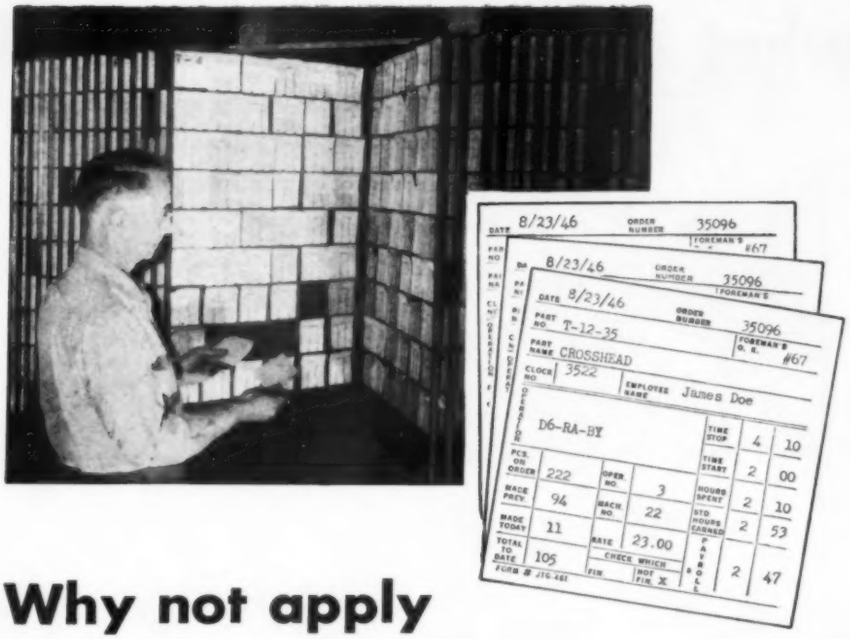
Other elements are sometimes added to give specific properties: to improve machinability, enhance scaling resistance, improve resistance to corrosion in specific, difficult cases.

Leading steel companies produce austenitic chromium-nickel stainless steels in all commercial forms. A list of sources of supply will be furnished on request.

EMBLEM OF INCO SERVICE
TRADE MARK

Over the years, International Nickel has accumulated a fund of useful information on the properties, treatment, fabrication and performance of engineering alloy steels, stainless steels, cast irons, brasses, bronzes, nickel silver, cupro-nickel and other alloys containing nickel. This information is yours for the asking. Write for "List A" of available publications.

THE INTERNATIONAL NICKEL COMPANY, INC. 67 WALL STREET NEW YORK 5, N. Y.



Why not apply Work Simplification to your Control Systems, too?

Compare the use of McCaskey multiple copy forms and "visible-filing" for Production Control, Payroll and Cost records with the usual posted procedures. The difference in essential operations shown by a simple process flow chart is most revealing. McCaskey eliminates numerous handling and posting operations. The advantages of visible records, immediately available, also add savings in both handling and time.

Barrett-Cravens Company, Chicago, made such a comparison in 1943 and adopted McCaskey for control of both special production orders and stock parts. A few of the important facts they secure, for example, with *only one writing* of their McCaskey triplicate time tickets are:

(1) Status of every production order, special or stock, visualized within minutes after the completion of an operation;

(2) Operation cost data immediately available for analysis and investigation of variations;

(3) Accurate, up-to-the-minute data reduce dependence on stock chasers;

(4) Incentive pay-roll records checked and quantity count verified;

(5) Verified record of production for operators on incentive work, *preventing disputes and dissatisfaction.*

Write for a demonstration and suggestions for an application to your particular needs—or send for a copy of "The ABC's of Production Control" and other descriptive folders.

McCaskey INDUSTRIAL CONTROLS

PRODUCTION • INVENTORY • TOOLS • COSTS • PAYROLL

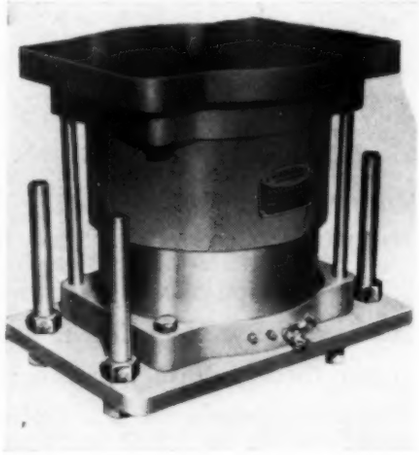
THE McCASKEY REGISTER COMPANY, ALLIANCE, OHIO

McCaskey Systems Ltd., Galt, Canada — The McCaskey Register Co., Watford, England

essed are applications of Kel-F. It is said to have satisfactory properties over a temperature range of from 700 F., from a low of —320F., to a high of 390 F.

Rust-Preventing Compound Added To All Sinclair Petroleum Products

A rust-preventing compound, known as RD-119, has been developed by Sinclair Refining Co., 630 Fifth Ave., New York 20, N. Y. This fluid is now being added to all Sinclair petroleum products as they flow through pipe lines to distribution points. A little more than 2½ gal. is said to be required to give rust-preventing qualities to 42,000 gal. of petroleum products.



Model CBM Pneumatic Die Cushion Provided with Regulator, Gage

A pneumatic die cushion, for use where four suspension rods carry the mounting plate which supports the die-cushion cylinder, is offered by Dayton Rogers Mfg. Co., 2824 - 13th Ave. S., Minneapolis 7, Minn. Listed as Model CBM, this type of installation allows the removal of the bolster plate without removing the die cushion cylinder.

Cushions are now furnished in ring-holding pressures from 1½ to 75 tons on a 100-lb. airline. Each cushion is provided with a combination regulator and gage, and a surge tank can be applied when maximum drawing capacity is required on the die cushion. Two stop rods are also furnished.

Select-O-Matic Power Press Unit Feeds Coil Stock Through Dies

The Select-O-Matic multi-pawl universal power-press feed unit is manufactured by Carl G. Peterson Co., East Providence, R. I., and dis-

FOR EXAMPLE

Model 9-D-13X. Price: less motor and column $48.75*

GLOBE MILKER COMPANY, INC.

[GAINS 400% INCREASE] IN PARTS OUTPUT WITH WALKER-TURNER 15" DRILL HEADS

Individual machining and drilling of four compound-angle legs on cup claws retarded production of milking machines at Globe Milker Co., Inc., Des Moines, Iowa. Frequent rejects for inaccuracy occurred, also.

Four Walker-Turner 15" Drill Heads, set-up as a special milling-drilling machine, cut Globe's original eight-step procedure to two operations, *increased parts output 400%*.

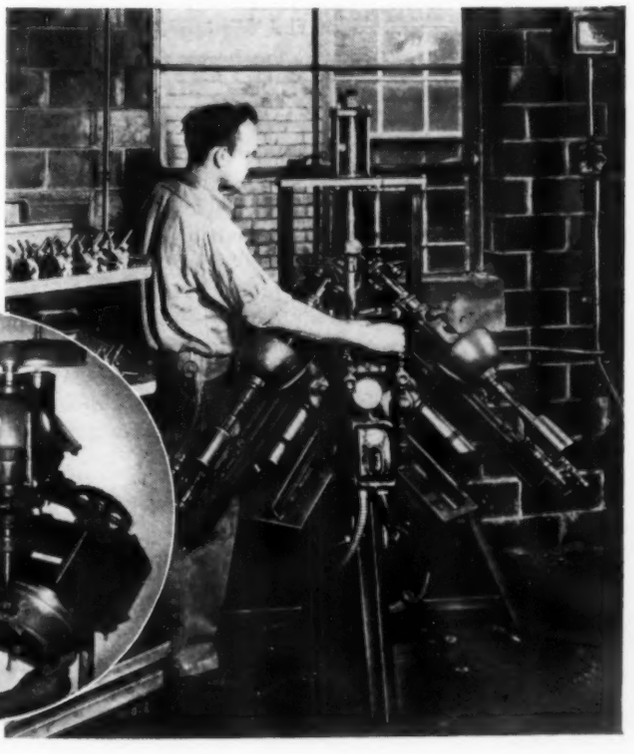
Now claw legs are simultaneously hollow-milled to .375"; drills then replace cutters, drill four holes to a tolerance of .002". Drill heads are pneumatically controlled and locked together for indexed gang operation. Better standardization and uniformity cut rejects to a minimum.

In another drilling operation—on the motor base—Mr. George Estel, Works Manager, says, "A special jig rotates the part, *drills 64 holes in a minute and a half*. This new set-up increases output from 30 to 140 bases per day."

Globe Milker uses Walker-Turner Machine Tools in 19 other cost-saving set-ups. For similar production speed and economy in your plant, investigate the Walker-Turner line. *For complete catalog, write to Walker-Turner Division, Kearney & Trecker Corporation, Plainfield, New Jersey.*

walker-turner MACHINE TOOLS

DRILL PRESSES—HAND AND POWER FEED • RADIAL DRILLS
RADIAL SAWS • BAND SAWS—FOR WOOD OR METAL
RADIAL METAL CUT-OFF MACHINES • MOTORS



Photo, far right: Four standard 15" Drill Heads in pneumatic feed special set-up, drilling and milling at compound angles.

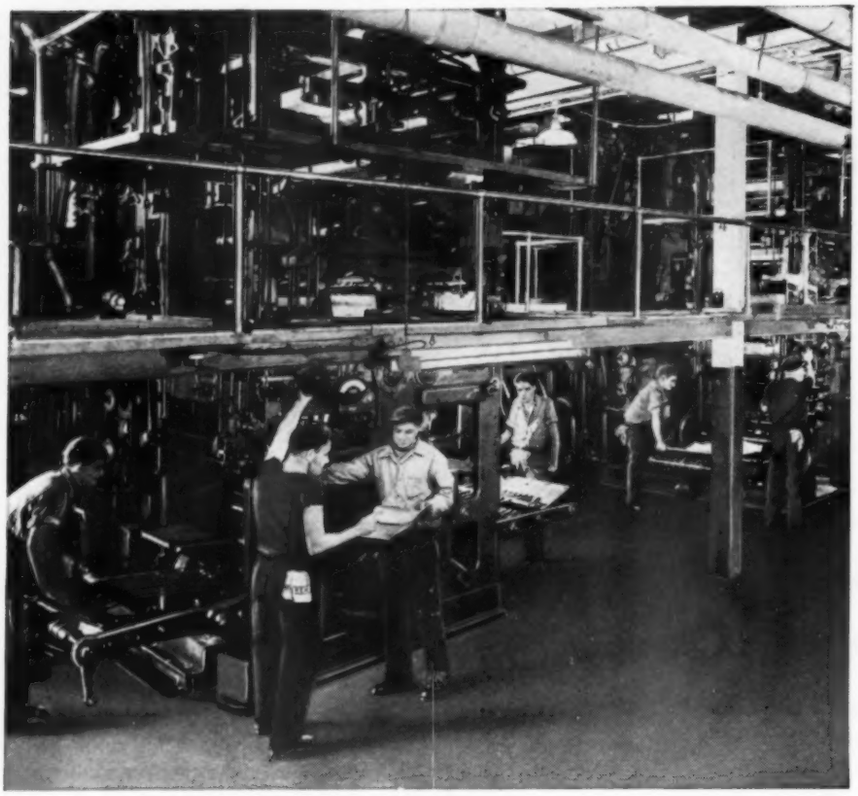
Photo, right: Drilling 64 uniformly spaced ventilating holes about base of aluminum motor frame.

**Photo, above:* 15" Drill Head, Model 9-D-13X. 4 ball bearings, 4¼" spindle travel, speeds with 1740 r.p.m. motor range from 600 to 5000 r.p.m. Capacity ½". Slo-speed motor optional.

SOLD ONLY BY AUTHORIZED
INDUSTRIAL MACHINERY DISTRIBUTORS

3464

"KEX" Industrial Wiping TOWELS



. . . More Important Every Day to the AMERICAN INDUSTRIAL SCENE

[View in McCall Corporation Press Room, Dayton, Ohio]

This prominent publisher of McCall's Magazine and Redbook has discovered the efficiency and economy of KEX Industrial Wiping Towels on a rental service basis.

The reason—KEX Industrial Wiping Towels are produced especially for wiping. They are soft, with no harsh seams, no hidden buttons to mar delicate surfaces.

Every wiping towel is thoroughly cleaned and inspected before delivery to you. They come in neat, easily stored bundles that help you control distribution.

Follow the lead of industrial leaders who overlook no opportunity to keep operating costs down—and efficiency up.

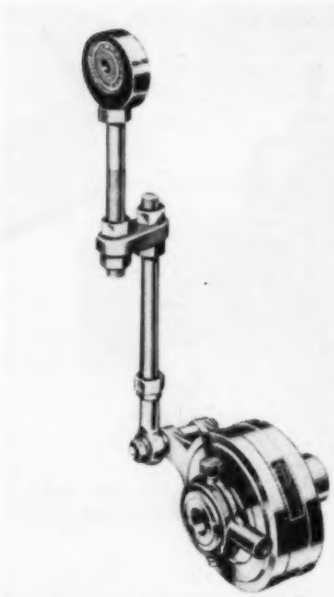
Nothing to Buy—No Expensive Inventory—Just a Low Monthly Rental. The first month should show a decided saving on wiping costs.

For complete information, see your classified Telephone Directory for nearest KEX distributor, or write KEX NATIONAL SERVICE, 295 Fifth Avenue, New York 16, N. Y.

"KEX" NATIONAL SERVICE

REG. U.S. PAT. OFF.

"KEX" REG. U.S. PAT. OFF. NATIONAL SERVICE A CALLAWAY MILLS PRODUCT INDUSTRIAL WIPING CLOTHS



tributed by Earl Elwyn Smith & Associates, Dept. AM, West Hartford 7, Conn. It is an adjustable universal ratchet-feed unit, designed to provide intermittent and unvarying movement of coil-stock materials through metal-stamping machines and punch presses. The coil stock is fed through the die with an accuracy to 0.001 in.

ROUND TABLE Discussion

IS BLUE MONDAY INEVITABLE?

In the case of most timeworkers, the "Mondayish" feeling asserts itself and, in a limited sense, pieceworkers are similarily affected. It could hardly be otherwise because human beings are creatures of routine, in the main, and don't take kindly to any revolutionary change of activity such as the transition from play to work. Only a minority work for work's sake. Encouraging a distaste for work is not only bad business; it is bad morality and bad industrial psychology.

In early times, there were, at least, mitigating circumstances to plead, hours were long and labor-saving machinery was in short supply. Small wonder that a man might feel tired and disinclined to work. Today, in the matter of hours of labor, things have changed, but the attitude of human nature towards work is much the same as then.

It is my opinion that week end re-

"IT'S A GOOD OUTFIT!" That's a statement you have undoubtedly heard or even made yourself about some manufacturing organization.

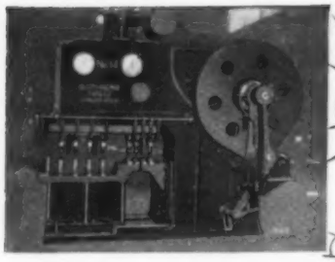
But what makes it a good outfit? A simple analysis shows that such a company's operations in *every* department are in capable hands . . . whether the sure, precise hands in engineering . . . or those in production, management, or even shipping. It is the type of company where Precision, Experience, Dependability are *applied* . . . to the benefit of its customers.

PRECISION • EXPERIENCE • DEPENDABILITY

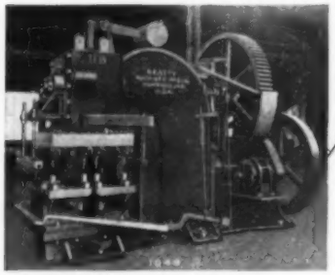
ALLIED CORPORATION PRODUCTS

ALLIED PRODUCTS CORPORATION
DEPARTMENT 42
4612 LAWTON AVENUE • DETROIT 8, MICHIGAN

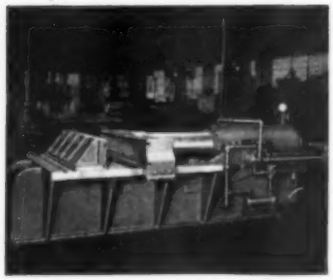
HARDENED AND PRECISION GROUND PARTS • STANDARD CAP SCREWS • SPECIAL COLD FORGED PARTS
SHEET METAL DIES FROM THE LARGEST TO THE SMALLEST • JIGS • FIXTURES • STEAM-HEATED PLASTIC MOLDS • SPECIAL PRODUCTION TOOLS • R-B INTERCHANGEABLE PUNCHES AND DIES • DIE MAKERS' SUPPLIES



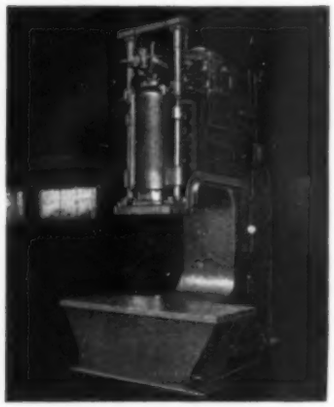
BEATTY No. 14 Toggle Punch for structural steel fabrication.



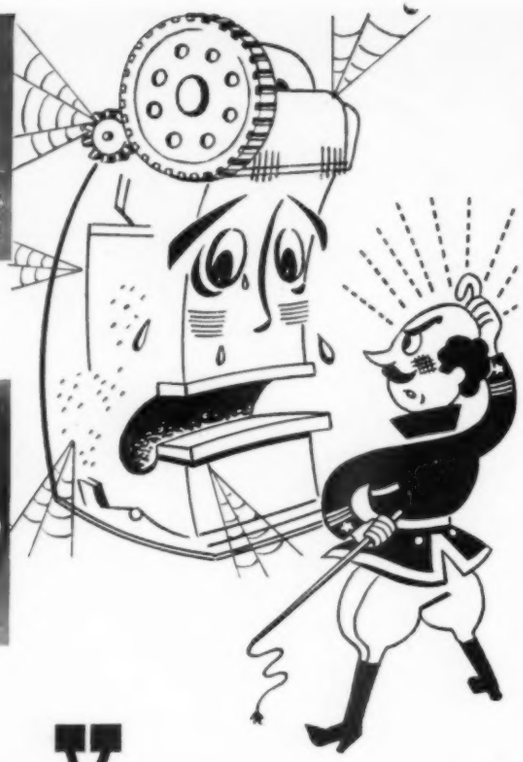
BEATTY No. 11-B Heavy Duty Punch extensively used in railroad industry.



BEATTY Horizontal Hydraulic Bulldozer for heavy forming, flanging, bending.



BEATTY 250-ton Gap Type Press for forming, bending, flanging, pressing.



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hashes are definitely harmful, not only to the work in hand but also to the individual, and the sooner they are put in their proper place the better for all concerned. It is difficult to understand how they could build, or indeed, help to build morale, because, of themselves, they are wrong in that they tend to encourage the shirking of a plain duty, a fair day's work for a fair day's pay.

Human nature being what it is, the week-end rehash would seem to be inevitable. But Al's hour of grace is no cure; it is only a palliative——and a poor one at that. Numberless men and women can advance what they regard as excellent health reasons in favor of half an hour off work here and an hour off there, at anyone's expense but theirs.

I cannot agree that bull sessions are even remotely essential to relieve tension which, if it really does exist, certainly does not owe its origin to hard work, long hours or, perhaps, not even to monotony of work.

C. D. Mackinnon
Lanarkshire, Scotland

•

BOSS . . . AND BUST?

It is a strange thing . . . this problem of educating men to become assistants. It seems that often the men best qualified from actual experience have no desire to advance. Men who have not progressed beyond the grade schools or even high school frequently do not have the initiative to get ahead. They do not want to assume responsibility.

A foreman today has a harder job to find an individual interested to become his assistant than in the old days. Why? It seems that unionization of the laboring class has introduced a new idea. Workers are told that management supervisors have many worries, that if the worker gets tangled up with management, he will wind up with ulcers and be a nervous wreck.

Why is this done? First it builds up unionism and makes it seem that if a worker stays with the union boss, he can retire and live on the fat of the land without a care in the world. Secondly, if a worker is fed propaganda of this type and believes it, he never will realize the actual benefits that come from being a management supervisor.

As Al points out, all men are not equal. However, actually few men like to turn down advancement. Most of them, if they cared nothing for the comments of their fellow workers, would grab an opportunity to get ahead. Today the problem of living

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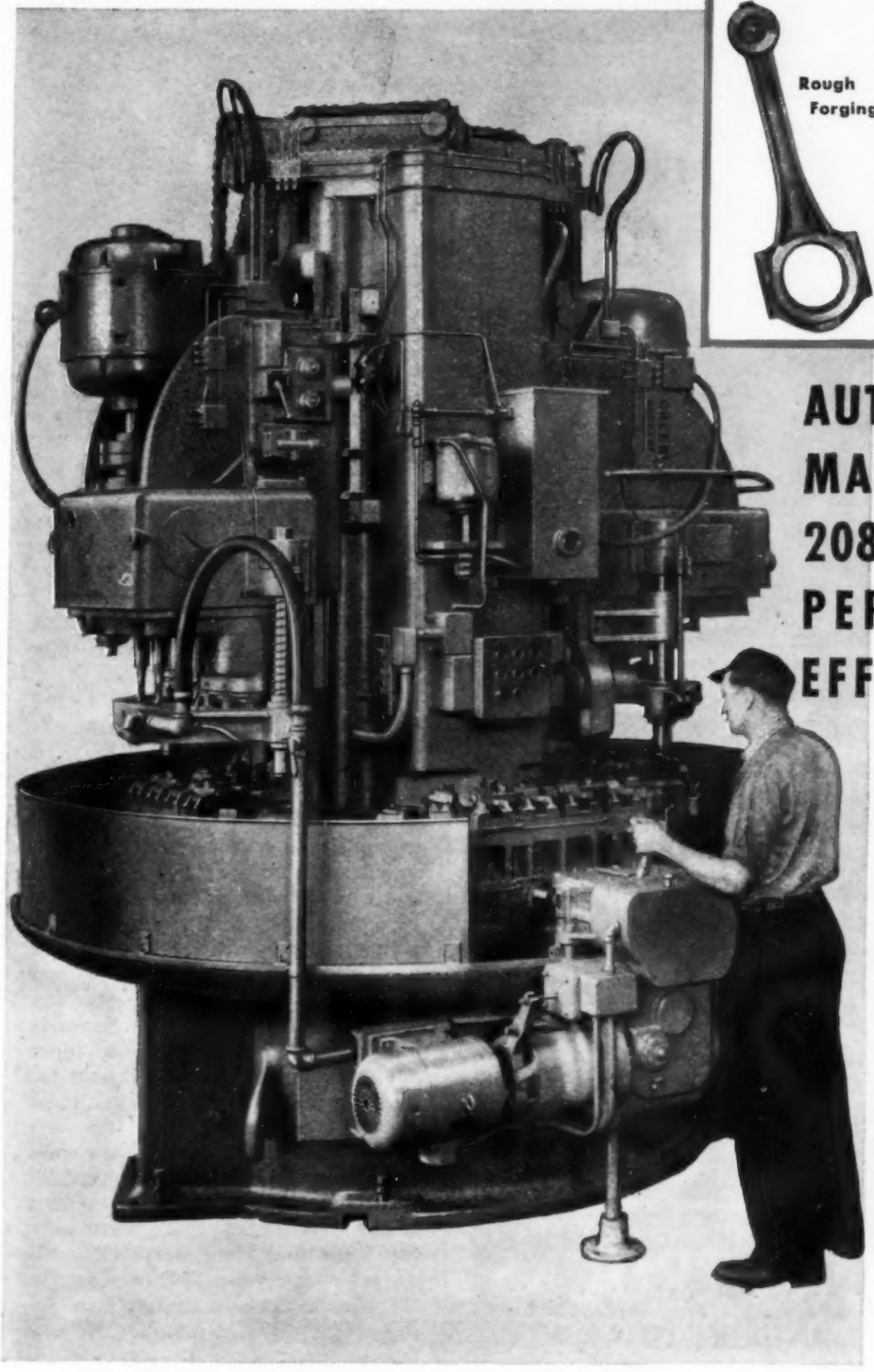

4-STATION AUTOMATIC INDEXING MACHINE PROCESSES 208 CONNECTING RODS PER HOUR AT 80% EFFICIENCY

This heavy-duty machine is typical of post-war design for mass production in the automotive industry. Connecting rod forgings, loaded four at a time, come out with the rough and finish boring, drilling, and reaming operations performed, the bolt bosses milled, and the caps sawed off. The machine is a center-column type, with three multiple-spindle-head units performing the sequence of operations listed below.

Power Wrench Reduces Operator Fatigue

As shown in the picture, the operator uses a lever-operated power wrench for clamping each load of four pieces in the special fixtures. This unit is fast and powerful, so the operator only has to release and remove finished pieces and drop in new blanks fast enough to keep ahead of the 55-second cycle time of the machine. The series of operations performed on the machine is:

Stn. 1—Load and unload.
Stn. 2—Drill 59/64" wrist pin holes. Rough bore 2.025"crank holes.
Stn. 3—Semi-finish bore wrist pin holes to .954/.953". Mill sides and ends of bolt bosses.
Stn. 4—Finish ream wrist pin holes to .965". Saw off caps.

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in a world of unionization is a rough one. Many men would rather take less than to be looked down upon by other workers as a turncoat.

Now then, how are we to overcome this great problem of finding men to become leaders for management? It is again the old story of lack of education by the general industrial world. Education by big and little businesses in first training their supervisors in the technique of teaching. And secondly, in the teaching of the foremen and the education of the worker in the way business operates.

Management must re-educate the thinking of these workers. It must place facts before them in terms that the worker can understand. It must build up the prestige of the foreman and make the position one that men desire to hold. When industry realizes this and all businesses get into the swing of education the problem of getting men to become supervisors and assistants will be eased.

Of course there will still be a few men who will refuse advancement. Those men are mentally lazy and don't want to expend the effort that would assist them to advance. We will always have a few of that sort with us.

Chas. D. Townsend
Centralia, Mo.

•

SHOULD SUGGESTIONS BE SCREENED

The object of the suggestion system in a plant is, of course, to encourage employees to take a greater interest in efficiency and production. A good many worthwhile ideas have resulted from this system.

In one shop, more than 40 years ago, a suggestion-box system was put into operation. Beside the box was a notice inviting suggestions from the employees. New ideas adopted would be liberally paid for by the company. Stationed in a most conspicuous position near the box was an executive. Suggestions were to be screened by the superintendent and the chief draftsman. At the end of the first month, there were only five ideas that were worthwhile, although there were 1500 workers in the plant. Because of the poor results, a new notice was put up asking the reason for the lack of response and stating that the contributors need not sign their own names if they did not wish to—if they did, the replies would be held entirely confidential.

Dozens of letters were received. Almost all complained that the whole business was too public. No

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"Miss Great Lakes" Gold Cup winner for '48

Depended on Wheelock, Lovejoy Alloy Steel

Photo Courtesy The Detroit News

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Properly selected alloy steel, from which vital equipment was fabricated, played a leading role in winning the grueling 1948 Gold Cup race that saw only 2 of 14 starters cross the finish line. The winner, "MISS GREAT LAKES", driven by Danny Foster and owned by Al Fallon, had underwater struts, rudder, jack shaft and steering pitman arm made from Wheelock, Lovejoy HY-TEN B #3X steel. This particular alloy was selected and properly heat treated to meet the most rugged conditions possible. The fact that not one of these parts failed or even bent, in spite of the terrific beating they took, is ample proof of HY-TEN's superior physicals. And it's proof too that Wheelock, Lovejoy knows steel. Perhaps you have a tough job that demands just the right steel—write Wheelock, Lovejoy today.

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one could go to the box without being observed by the supervisor and several foremen.

The result was that a dozen suggestion boxes were put up in inconspicuous places. This new method was successful for many years. The failure of the previous method was due not only to the conspicuousness of the boxes, but also because the foremen often openly discouraged their men from participating. They seemed to think that any suggestion would reflect on their ability as leaders. Some of them hated the idea that one of their men would be in the limelight after the acceptance of a good idea.

A suggestion system is useless unless it is truly secret, and adjudged by a competent board and management. Then the worker need not feel that he will suffer any repercussions and will be sure that his idea will receive expert judgment.

Arthur Silvester
Niantic, Conn.

•

FOREMAN OR REFORMIN'?

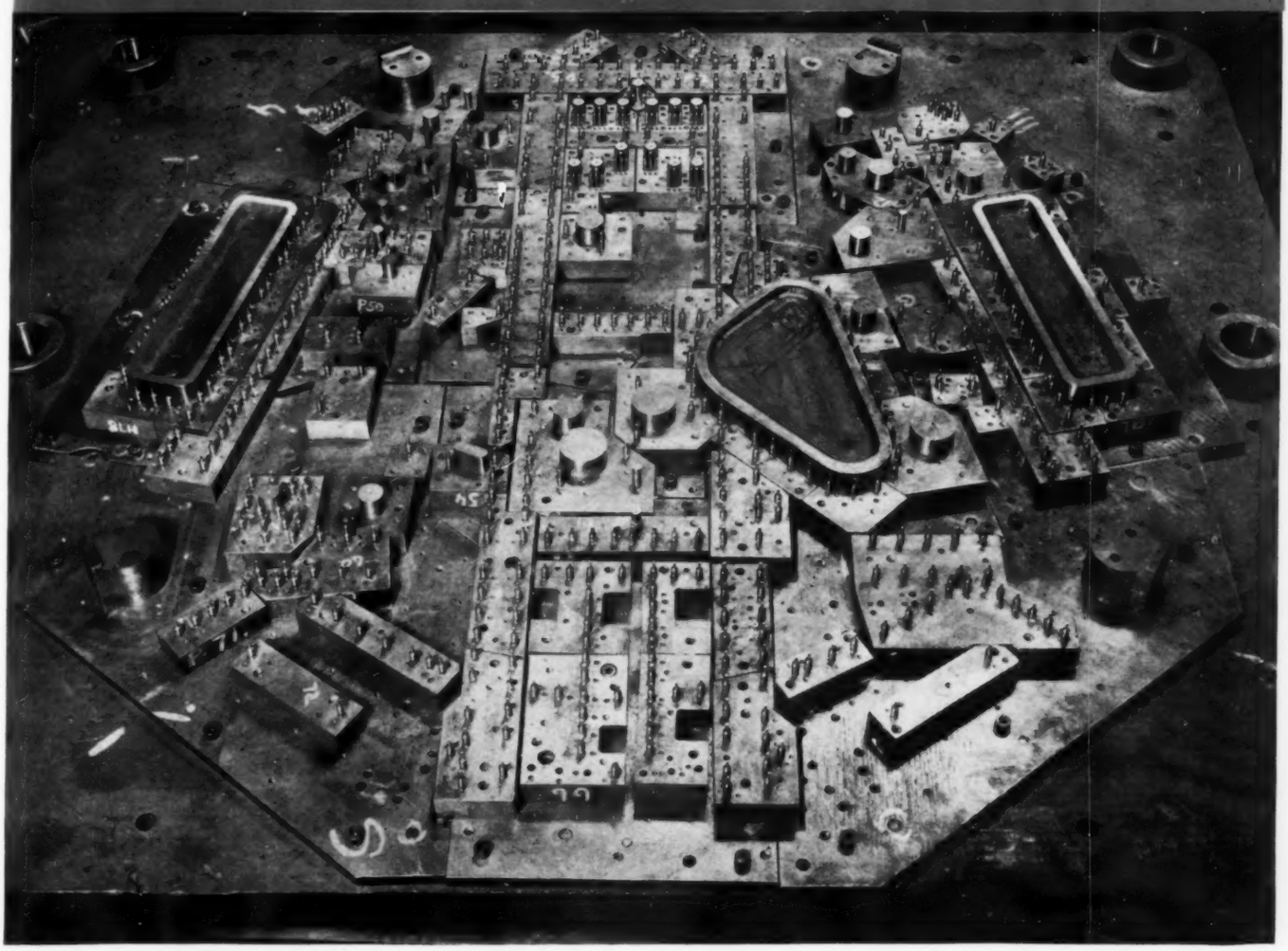
Where the problem of company relations involves the reading of a management communication to the men, it properly belongs in the category of good foremanship for the foreman to explain the directive, and, in so doing, give it the added weight of personal consideration. A letter from management furnishing facts to workers can best be brought to them through the foreman. Merely tacking up the letter on the bulletin board will not meet the situation.

The foreman should call his men together and read the letter from management. He should be prepared to explain any portions which are not clear to the men and answer pertinent questions. The foreman is in a better position than a company relations man in bringing the matter in its true light to the understanding of his men. They know him through their everyday contacts with him, and he understands their mental processes better than an outsider. It is his responsibility to act as the representative of management in ironing out difficulties. The foreman is a reformer when it comes to setting his men straight on preconceived ideas originating in unfounded rumors. The good foreman seeks to do justice to both his men and management. By his fair and unbiased actions he can clarify potentially disruptive matters and adjust difficulties that threaten good company relations.

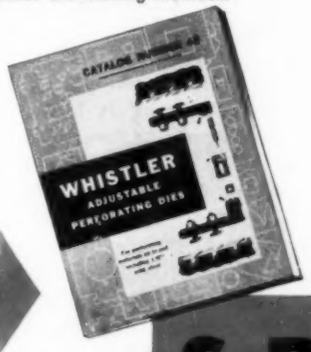
Foremen must win the confidence

It just doesn't make sense

to tie up manpower and spend money needlessly when there are quicker, more economical ways of doing the same job better.



Here is the punch arrangement of a 70" x 84" Perforating Die set weighing approximately 6 tons. You can see for yourself the cost and production advantages of *removable* units and sections over other die making methods.



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of their men. Regardless of the formation and operation of a personnel department it is but natural that a large proportion of the working force will continue to look to the foreman as the means of contact with the firm. Thus, the foreman will be likely to occupy a natural place in the esteem and confidence of the workers which cannot be duplicated by any artificial relationship which the company relations man may attempt to establish. Workers will confide to a foreman matters concerning personnel relations that will enable him better to exercise his supervisory authority and to dispense supervisory justice, providing he has won their esteem.

Lack of confidence in the management on the part of the employees may be due to failure of the foreman as management's representative to guide the workers' viewpoints along proper lines. The extent of cooperation extended to management by the workers during routing operations. The most effective way in which the foreman may assure the worker of his interest and that of the firm as a whole, in his problems, is an intangible one—his general attitude. To secure the cooperation of his men on the basis of such an attitude is a gradual achievement and one that is based on effective handling of particular situations.

It will be found that the average worker is more receptive and reasonable toward management's side of a company-relations problem when the foreman handles the matter personally instead of permitting action by a company relations specialist.

Harry Kaufman
Philadelphia, Pa.

•

GAMBLING ON THE LONG GREEN

Reynolds is, perhaps, taking a long chance, but no fault can be found with a young man who wants to take advantage of every opportunity to better his condition.

From Ed's account, it looks as if the new firm is not too well financed, and a larger percentage of the failures in business is due to lack of adequate capital. There are many new firms which are catch-penny schemes, where the instigators are anything but square.

Take the case of a would-be corporation where some money was put in and then easy marks were induced to invest. They bought a portion of the stock and nearly 49% of it was sold. After a time, a small

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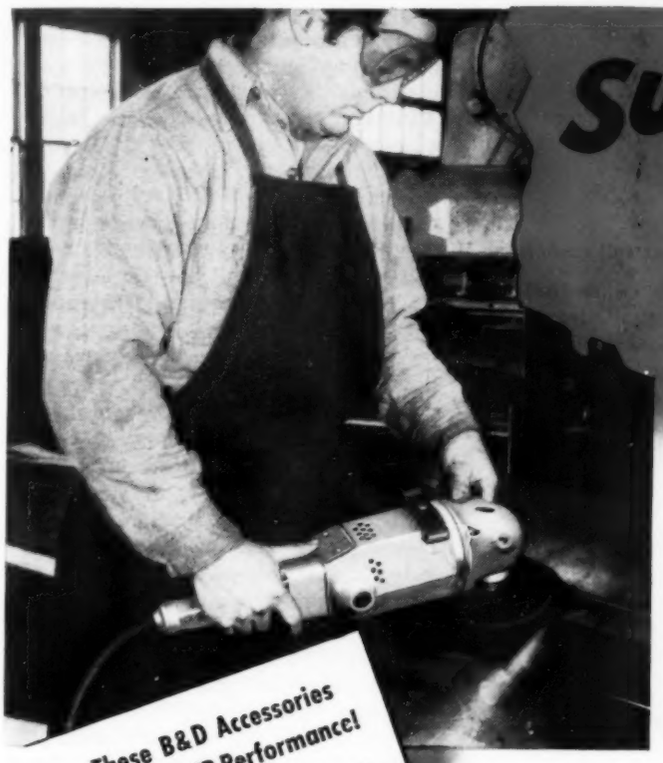

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Between the two coils is the "Oilout", which purges the system of crankcase oil and dirt, keeps it always at full capacity.

The "Balanced Wet Bulb" control holds head pressure at the practical minimum. It automatically proportions the fresh air stream to the condensing load with the full benefit of power-saving on cool days, providing full capacity for peak loads.

Niagara Aeropass design results from over fifteen years' experience condensing by air. It is completely trustworthy for year 'round operation. Users say, "It saves half the difficulties and labor of running a refrigeration plant."

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assessment was made and this was repeated until many of the buyers of the stock dropped out, while the originators came out of it a very profitable bag.

Now, returning to Reynolds, his new employers may go either way. Evidently he thinks he will better his condition by making the change, but he should consider all phases of the subject, which many young people fail to do.

After 53 years of experience, from machinist apprentice to the supervision of more than 3000 men successfully, it seems that considerations in the order shown are essential:

1. Finances.
2. Markets for the new products.
3. Business ability of the management, including sales activity.
4. Experience of those in charge to produce the new line of work.
5. Working conditions to be established.
6. Opportunities for promotion.

It is doubtful if Reynolds would see the subject in this light.

In one-half of the cases, it is believed that the uppermost subject in a young man's mind would be the chances for promotion, and the consequent increase which would come in the pay envelope.

F. H. Stebbins
Worcester, N. Y.

•

It looks to me as if Reynolds is getting a lucky break. He is being given a possible opportunity of financial success and will be paid a living wage while building up the enterprise. The reduction in wages will be more than offset by the experience he will get while making the new gadget.

Just why any foreman should upset himself about a machinist quitting his job is difficult to understand. It is an everyday occurrence. Of course there are exceptions to the rule. In some shops there are special machines and work that entails a lot of money and training. It may cost the employer thousands of dollars before the man is sufficiently trained and has become expert enough to earn a profit for the employer. If such were the case Ed would be justified in informing Reynolds that he owed it to his employer to stay until another man was proficient on the job.

Youth is definitely the time to take chances and to experiment. If you lose while young, you get over it and start again. As you grow older you lose initiative, energy, and enterprise.

Management today is, in the most

part, far different than what it was years ago. Then, the majority of employers would have tried to prevent young men like Reynolds from having the opportunity of becoming a possible part-owner on any enterprise. Most present-day executives would wish Reynolds the best of luck, and, that is what, in my judgment, Ed should have done.

Arthur Silvester
Niantic, Conn.

•

The urge of some people to go into business is very great; the matter is ever uppermost in their minds.

If the young man's circumstances are such that it is possible for him to engage in the line in which he will be more satisfied that particular line is the one that he should try. Without a trial to prove his theory, he will never be satisfied. He may make a failure in this chosen line, but he will never be satisfied or content without making a trial, and the experience will be worth while.

A man whom I know worked at what was to him an uninteresting job, but he dealt in several small things in spare time on the side. He would say to his friends that on some certain deal he had made the price of a suit of clothes, or perhaps the price of a pair of shoes and I remember once he mentioned that his gain would buy him a necktie. He never mentioned his regular salary job which was routine. However, I think that at least 75% of his thoughts were on his sidelines, which gave him not greater than 10% of his earnings and often for long periods gave him no return whatever. This man never did get properly located.

It's not always best for one to follow his desires. More than a desire for a certain line of endeavor is needed; there must also be ability as well.

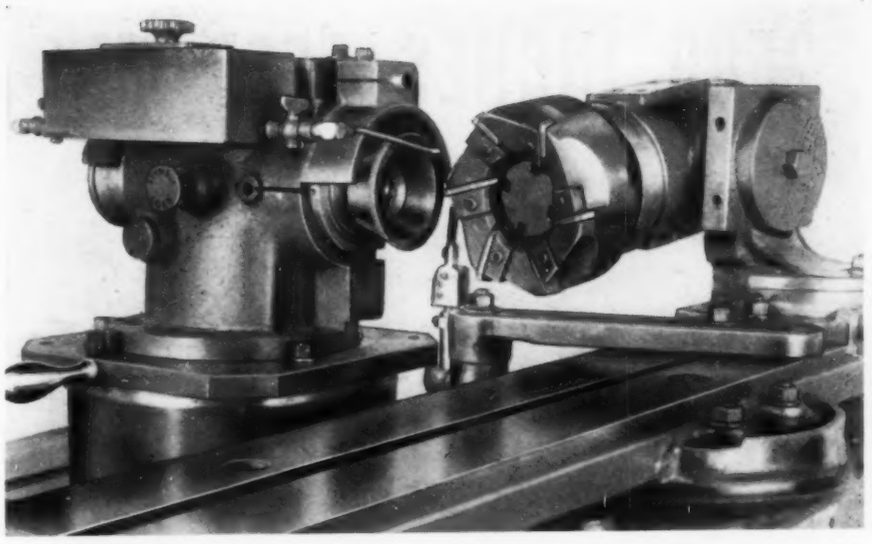
Abel Blakeman
Watervliet, N. Y.

•

PROSPECTING

I do not think that there can be any fixed rule regarding any intent to change by any employee. Some employees will make their intent known in some form or other before securing another job; others will get their jobs, then notify their employer. Circumstances surrounding each case are the determining factors as to how employees handle their problem.

Although it is ethical to pursue the socalled "look before you leap" policy with respect to job seeking, I do however feel that employees following such a policy should give



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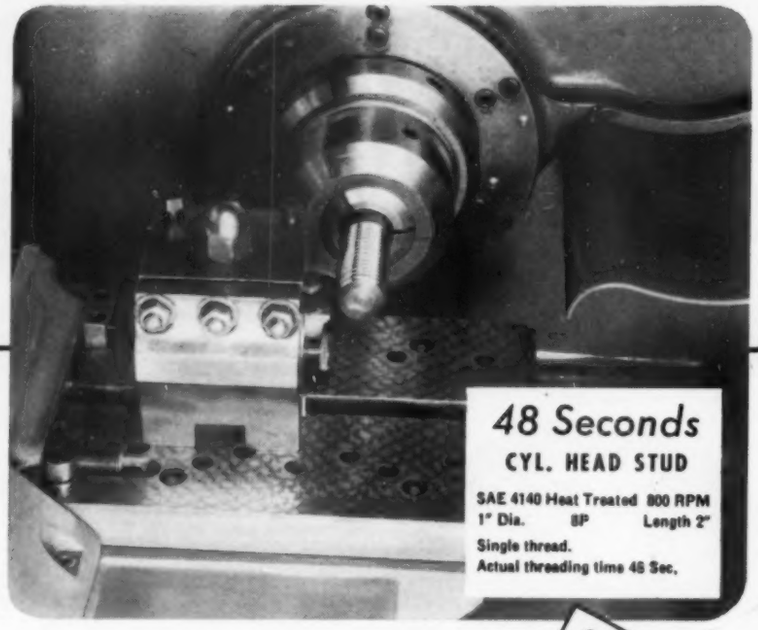

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their employer reasonable notice. There is only one basic reason why anyone seeks a change in employment, and that reason is dissatisfaction in some form or other. Therefore management's only approach in attacking the problem of job prospecting is to develop alert supervision along the channels of anticipating and detecting reasons which might create dissatisfied employees.

Again it must be taken into consideration that as long as there are men with the initiative to forge ahead in industry, secret job prospecting will continue. In such cases it would be sheer foolhardiness to try to discourage it. Many of my experiences with men who failed to signify any intentions to change jobs have indicated that such tactics were used in order to pull them from a rut. They had felt that had their intentions been made known, inducements in some form or other would have been made in order to get them to stay at their present job.

Peter L. Budwitz
New Britain, Conn.

•

At a time when jobs are plentiful it is not unusual for workmen to express their unrest in some way that will get to their employers the fact that they are on the lookout for something better. By the same token, when jobs are not easily procured, those same employees are careful about keeping their feelings to themselves when they are discontented. When it comes to the point that they decide to look about for another job, they will simply ask for some time off, or stay away from work for a day without asking permission.

These are just the usual actions of human nature regardless of the present job.

An employee, in all fairness, is entitled to a reasonable advance notice of a lay-off or discharge, and the employer is entitled to the same courtesy from the employee.

I can see no valid reason why an employee should not be privileged to seek another job whenever he thinks he can be better satisfied by the change, and the employer should be free to dispense with an employee with due consideration and advance notice—always on the part of the party requesting the change. Such action should cause no change in friendship or future re-employment possibilities.

It is not a good state of affairs when an employee gets a raise in pay or perhaps a change in work only after being offered it at another shop. This is something that should be

avoided, as it is usually hard for the workman to understand why the increase in pay could not have been given without pressure to secure it.

Both employers and employees should have liberties to as great an extent as they can use without interference with the other party. However everyone, especially at the present time, should be moderate in his demands, realizing that every individual must bear a fair share in rehabilitating the world.

H. B. Martin
Watervliet, N. Y.

•

To paraphrase an old song, "the dissatisfied worker may leave, but the malady lingers on." The employee who quits because of dissatisfaction with his job, supervisor, or personnel setup, without informing the employer what was wrong, gives no aid to management willing to rectify the existing conditions. It is to the best interests of both men and management for both to make known any intention to change. The worker will benefit through possible amicable adjustment of the matter within the framework of the present employment, and management will benefit through correction of a possible deleterious personnel policy. The traditional "look before you leap" policy is fair to either party, if both practice it.

Of course it is an employee's privilege to take advantage of his natural liberty under the free-enterprise system to look around for another job if he is dissatisfied with his present one. However, it is believed that it would have been better for the worker to have informed his foreman of the real reason he wanted the day off, to look for another job, and the cause for so doing. The matter may have had possibility of solution. The foreman who is scrupulously fair in his dealings with his men can usually arrive at an amicable understanding in settlement of any dissatisfaction, either real or fancied, on the part of his men.

When the worker starts looking for another job, the fault may lie in the kind and type of supervision he has been getting. Immaturity of supervisory activities may show up in high absenteeism, high turnover, waste, widespread grousing, and needless grievance cases. Many mechanics work with the brakes on simply because they have second-rate supervisors. In some plants, many employees feel hesitant in talking over their work or ideas with their bosses, or expressing their honest opinions, and believe that their supervisors are making little or no

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effort to make them feel they are part of the company.

If workers are given expert leadership they will be loyal and conscientious employees and will increase their output and usefulness. It will be found that turnover of skilled employees will decline, and unit cost of making the product will drop despite higher labor and material costs, where good leadership is practiced and foremen invite critical suggestions and give the men credit whenever they do good jobs. A good boss keeps his good men by helping them to feel more proud of themselves. He treats them as important individuals and helps them feel that their best effort will be important to the company.

Good workers will not leave a good company. However, while good management realizes that all people respond better if they are given loyalty and recognition, it knows that some incentives are more effective with some people than with others. It tries to figure out what each of its employees seems to want most: praise, security, promotion, or money. It is the rare person who works for money alone, and it is also a mistake to assume that everybody is working for a promotion. The old-line boss argues that all this business of using praise and diplomacy to retain good workers is dangerous nonsense. Give a man a pat on the back, he claims, and he will hit you for a raise the next day. Actually it does not work out that way. Employees in modern industry are realistic and understand that the boss is bound by budgets and set pay schedules and will do the best he reasonably can for them. If the men are treated well they will respond by loyally staying with the firm and doing their best work.

When a worker makes known his intention to leave, the company is enabled to make an effort to retain him in case this should be desired, and at any rate an attempt may be made to secure information concerning his reasons for leaving. Such information is of more value than the mere preparation of statistics. It enables the management to understand the features of the plant which must be remedied if the costs of labor turnover are to be reduced.

A personnel policy that embraces an exit interview to determine the cause of leaving will help in setting up a measuring stick of the effectiveness of the personnel policy of the plant. Whether the voluntary withdrawal is because of dislike for the work, "better job" (which frequently should be interpreted as

"higher pay"), conditions at home, or other reasons, should be fully determined before the employee leaves. At times the real reason cannot be ascertained; but at other times if as much care is given to the interview when quitting as is given to the interview at selection, some real information will be secured for labor policy determination. The first cause given by the worker cannot be accepted always as the real one.

When a good worker makes known his intention to leave, it is sometimes possible to retain his services by transferring him or promoting him. A promotion system, which frequently involves transfers, is a most valuable adjunct to any personnel policy, where it can be worked out. Lines of promotion should be clearly defined wherever possible, and every effort made to create real lines of promotion. One of the reasons why a well-developed system of promotion and transfers is necessary, is that if some such scheme is not worked out, there will be small chance of preventing the foreman from keeping his best workers in the jobs that they hold. He is principally out for production at lowest cost. That is why he is there. When he finally gets a round peg fitted into a round hole, and a square peg fitted into the famous square hole, he wants to keep the pegs right where they are and not start his carpentry work all over again. Transfers as a means of job adjustment offer a good possibility for meeting the problem of the dissatisfied worker who is prospecting for another job. Taking a lesson from "acres of diamonds," better prospects of a prospecting worker for a higher position may be found through transfer to another department of his company.

Harry Kaufman
Philadelphia, Pa.

TO THE EDITOR

"How to Work Aluminum and Its Alloys" by Anderson Ashburn in the July 1st issue of AMERICAN MACHINIST is an outstanding article, well written and so full of pertinent and helpful information that it is sure to be used as a bible on aluminum by metalworking companies for years to come. It is its very excellence which increases our dismay over the discrimination against the screw industry and this company in particular by the complete omission of screws under Section 5, "Joining

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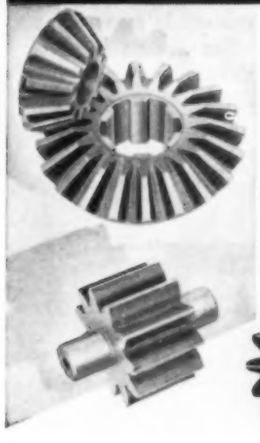

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Methods," of this special report.

We manufacture large quantities of machine screws, tapping screws, Type A (coarse-thread, gimlet-point), Type B (coarse-thread, blunt-point), tap screws Type G (machine-screw thread with slotted point to cut a mating thread), square and hexagon machine-screw nuts, wing nuts and a number of special products, all of various aluminum alloys as well as a complete line of fastenings made of other materials which are used for joining aluminum. Typical of this latter category are the alloy-steel, cadmium-plated, close-tolerance machine screws supplied the aircraft companies by the billion during World War II for fastening aluminum sheets.

We realize, of course, that it is far too late to do anything about this article on aluminum but we wish to register our protest so that screws, etc., will not be overlooked in any article you might run in the future on joining methods for other materials—since we make fasteners for everything from the common everyday uses to the more exotic ones such as human bones, atomic bombs, paper, shoes, sealing wax, cabbages and kings.

H. F. Phipard, Chief Engineer
Continental Screw Company

NEW BOOKS

PROFESSIONAL REGISTRATION LAWS AND THE ENGINEER—*By A. M. Sargent, Doctor of Engineering, Registered Professional Engineer. Published by the author.* 8½x5½ *in.* 57 *pages. Price* $.75.

Something should be done, and in a hurry, about the present ambiguous engineering registration laws, and this author proves it! With the aid of some prime examples of how foolish many of them are, and how unwisely they can and have been applied, he demonstrates what non-engineering thinking has gone into them.

One of the tripping-stones of the problem is the definition of engineering itself. Since it is one of the widest and most varied of all fields, it cannot be encompassed by one law or set of rules. In addition, the author points out the needlessness of licensing many kinds of engineers at all.

The book is a thought-provoker, and demonstrates what engineering logic should have done, and still can do, to protect and improve itself.

Names in the News

Leonard E. Parker

Leonard E. Parker has been promoted to vice president and general manager of Cummins Portable Tools, division of Cummins Business Machines Corp.

Henry A. Bair, formerly general foreman, has been appointed manufacturing superintendent of the Cathode Ray Department, Sylvania Electric Products, Inc., Emporium, Pa.

Reg Anderson has been appointed sales engineer for New York State and New England for the Threadwell Tap & Die Co.

George R. Prout, vice president of the General Electric Co. and general manager of the Air Conditioning Department, has been named an assistant general manager of the G-E Nucleonics Department. Mr. Prout will become general manager of the department Jan. 1, succeeding **Roy C. Muir,** who will continue as a consultant. **Harold F. Smiddy** will become general manager of the Air Conditioning Department, **Robert S. Neblett** will be in charge of Nucleonics Department activities in the Schenectady area.

Vernon L. Cox has been named manager of engineering for the Switchgear Divisions, Apparatus Department, of the General Electric Co., succeeding C. H. Black, who has been appointed manager of engineering of the Construction Materials Department.

C. W. Staacke, formerly of the B. F. Goodrich Co.'s engineering staff, has been named technical consultant of Hewitt-Robins, Inc., and will be special assistant to the president.

Ralph M. Hoffman, president of Link-Belt Co., Pacific division, has been elected a vice president of the parent Link-Belt Co., Chicago.

Sculpture In Steel . . . Master Hobs—delicately detailed in HSC 422 alloy tool steel—preferred for its toughness and hardness—for its ability to retain shape, design, sharp delineation, under extreme pressures.

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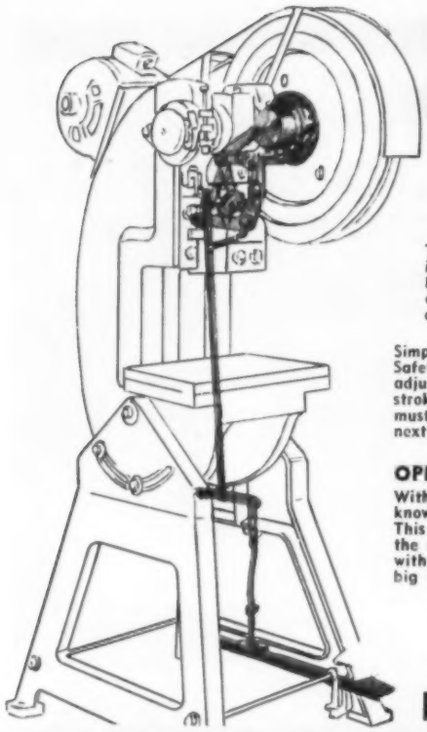

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W. F. Armstrong

W. F. Armstrong, a vice president of General Motors, has been named general manager of the Chevrolet Motor division, succeeding the late Nocholas Dreystadt.

M. P. Winther has been named vice president and director of engineering of Eaton Mfg. Co.

Paul Brainard, formerly assistant supervisor of hoist design for the Hyster Co., has been named head of the new Engineering Standards Department.

Carl J. Lamb has been appointed consulting engineer of the Hydraulic Press Mfg. Co., Mt. Gilead, Ohio.

Jaeger Machine Co. has reelected officers, including the president, **Ray M. McLean.**

E. B. Forse, manager of the Refractories division, Perth Amboy, Carborundum Co., has been appointed assistant vice president. C. E. Hawke, director of sales, became manager of the Refractories division, Nov. 1.

D. A. Gurnie has been reelected president and treasurer of the Erie Foundry Co., Erie, Pa., and **F. F. Clark** has been named honorory vice president; **James A. Currie,** first vice president; **Robert N. Yates,** second vice president, and **C. D. Pinney,** secretary.

William A. Carlson, former works manager for the Racine Tool & Machine Co., has been named vice president in charge of manufacturing of the Acme Pattern & Machine Co., Buffalo.

L. A. Dixon has been appointed vice president of the Rockwell Mfg. Co.'s meter and valve divisions, Pittsburgh, Pa. He formerly was president of the Pittsburgh Du Bois

Co., acquired by Rockwell.

William F. Coleman has been elected vice president of sales for Amgears, Inc., subsidiary of Hupp Corp.

A. A. Vetter has been appointed consulting sales engineer for the Buhr Machine Tool Co., Ann Arbor, Mich.

V. Paul Yale has been named Michigan and Indiana district representative by the Walker-Turner division, Kearney & Trecker Corp.

Marshall G. Munce has been elected vice president of York Corp., York, Pa.

George C. Martin has been appointed chief project engineer for the XB-47 Stratojet bomber at the Boeing Airplane Co., Seattle, Wash., and **W. W. Rutledge** has been named production manager, filling the vacancy created by the transfer of **Harold Olson** to the Wichita division as factory service manager.

William Burnett, chief Ford experimental engineer, has been named assistant chief engineer for Ford passenger cars.

Raymond R. Rausch has been elected vice president of the General Electric Co. and will be in charge of company manufacturing policy, succeeding **Elmer D. Spicer,** who retired.

John D. McCrystle has been appointed assistant to the president of the Upson Co., Lockport, N. Y.

R. E. W. Harrison has resigned as vice president of the Chambersburg Engineering Co. and will devote his time to a limited number of business interests, principally in a technical advisory capacity.

BUSINESS ITEMS

Kennametal, Inc., Latrobe, Pa., is erecting a new building to house the carbide division and is adding to the laboratory building at an expenditure of more than $200,000.

Vanadium Tool Co., Athens, Ohio, has purchased the office and factory buildings of the former **Harps Mfg. Co.**

The Cimcool division, Cincinnati Milling Machine Co., has opened a new direct sales office, 4053 Lindell Boulevard, St. Louis, with M. R. Skirvin in charge.

Elgin National Watch Co. has changed the name of the **Sapphire Products Division,** Aurora, Ill., to Industrial Products Division.

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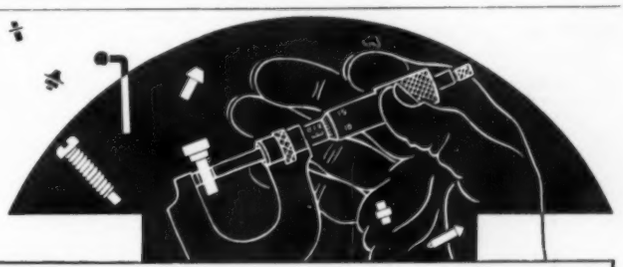

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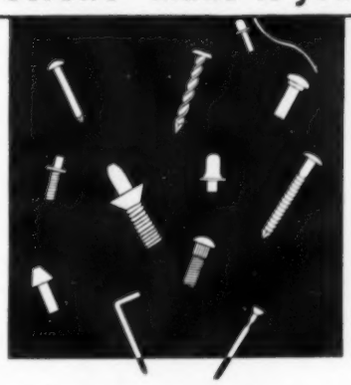

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They feature utmost flexibility for handling a wide variety of gears. Continuous cutting motion, exclusive with Cross, speeds production at top efficiency.

Special skill is not required because machines are automatic and push button controlled. Power clamping is foot pedal controlled. Both hands are free for work handling.

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spur gears
helical gears
clutches
splines

Typical productivity when rounding or pointing 8 pitch 30 tooth gears is 55 net hourly.

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For pointing or chamfering external and internal:

clutches
spur gears
bevel gears
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Typical productivity when pointing 10 pitch 30 tooth gears is 100 net hourly.

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For burring or chamfering both ends at the same time.

helical gears
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American Machine & Foundry Co., New York, has acquired manufacturing and leasing rights to the **E. T. Oakes Corp.'s** continuous automatic mixer.

Lucas Machine Tool Co., Cleveland, Ohio, has placed George F. Green in Dearborn, Mich., as direct representative to cover Fort Wayne, Ind., Toledo, Ohio area and the eastern part of Michigan; Richard W. Tesch has been established in Cincinnati to cover the Southern parts of Ohio, Indiana, Illinois and all of Kentucky.

Fenn Mfg. Co., Hartford and New Britain, Conn., has acquired from the **Standard Machinery Co.**, Providence, the main line of machinery manufacture. W. L. Fenn, president, said operations will continue at the Standard plant, but during the next three months the acquired lines will be moved to Hartford and New Britain.

National Cylinder Gas Co. has established new executive headquarters at 840 North Michigan Avenue, Chicago. The building was recently purchased by National.

U. S. Hoffman Machinery Co., N. Y., will manufacture on an exclusive royalty basis **Dudco Products Co.'s** (Hazel Park, Mich.) vane-type fluid motors and pumps for use on their own machinery.

Forest City Machinery Co., Cleveland, has been incorporated to manufacture machines and do job machining. John Petrov is president.

National Cash Register Co. has purchased the former **Aeronautical Products, Inc.**, plant in Washington C. H., Ohio.

Garr Machine Co., Cleveland, has been formed to rebuild and resell used industrial machinery and equipment, Albert L. Rhea is president.

Crocker-Wheeler Electric Mfg. Co., division of **Joshua Hendy Corp.**, Ampere, New Jersey, has reopened its Buffalo branch office in the Ellicott Square Building. The branch is headed by Louis E. Rau.

Economy Engineering Co. has moved manufacturing facilities to a new plant at 4511 West Lake Street, Chicago.

Hanchett Magna-Lock Corp., Big Rapids, Mich., has been organized to continue the line of magnetic chucks formerly produced by **Hanchett Mfg. Co.** Officers are: J. F. Manting, president; D. D. Stone, vice president and treasurer, and R. V. Hanchett, secretary.

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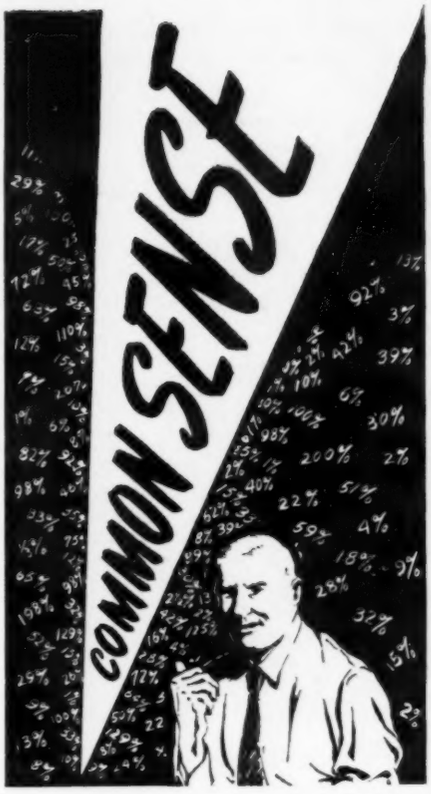


COMMON SENSE in the shop would seem to call for careful cutting fluid application, because oil that improves one operation may not be right for something different. *There just isn't any "one shot" cutting fluid that can do a large percentage of all jobs!* Consider all the variables—the wide variety of speeds, feeds, materials, tolerance and finish requirements encountered in machining operations in one shop. Those are the considerations that make it economical in the long run to be sure the cutting fluid you use is scientifically correct. "On-the-job" tests help you determine what cutting oil qualities are needed, and may even result in a decrease in the number of oils now used. It is plain common sense to call in cutting oil experts . . . people with a sound background of practical experience who can be relied upon to recommend the right cutting fluid for the job.

—Chip

SOLVOL

water mixed cutting compound

Solvol is more than just a high grade, emulsifiable cutting fluid. It is a unique super soluble product with the extra metal cutting qualities that will solve some of your machinery problems and help eliminate production headaches. Ask for literature.

Another Time-Tested Stuart Product

STUART *service goes with every barrel*

D.A. Stuart Oil Co.

2729 SOUTH TROY STREET, CHICAGO 23, ILL.

Hydro-Line Mfg. Co., Rockford, Ill., has named **Rogers and Baxter,** 2013 Olive Street, St. Louis, exclusive representatives for air and hydraulic cylinders and special machinery in the territory including the southern part of Illinois and the states of Missouri, Iowa, Nebraska, Kansas and Oklahoma.

Wallace F. Ardussi, Cleveland, has purchased the **Variety Machine & Stamping Co.**

Walker Hydraulic Duplicator Co., Standish, Mich., has been established by C. E. Walker, formerly associated with **Turchan Follower Machine Co.,** Detroit.

Michigan Abrasive Co. has opened its second plant and has removed its general offices to the plant at 2360 W. Jefferson Avenue, Detroit.

Moto-True Co., Cleveland, has opened an office in Chicago under the name of **Moto-True Sales Corp.,** 2404 South 51st Street.

Doehler-Jarvis Corp. has purchased the former **Gordon Mfg. Co.** plant at Toledo.

Clarostat Mfg. Co., Inc., has moved all operations to Dover, N. H.

Bell Aircraft Corp., Buffalo, has purchased the **W. J. Schoenberger Co.,** Cleveland.

Delapena & Sons, Ltd., Cheltenham, England, has appointed **Motch Merryweather Machinery Co.,** Cleveland, as exclusive selling representative for their external honing equipment in the continental United States.

Empire Die Casting Co. has been incorporated by **Philip F. Rogel,** former president of **Impression Tool & Die Co.** The new company has acquired the **Lawrench Die Casting Co.** plant and equipment in Cleveland.

George Haiss Mfg. Co., Inc., New York City, division of **Pettibone Mulliken Corp.,** Chicago, has appointed S. DeVries exclusive sales representative in Connecticut. Mr. DeVries' address is PO Box 31, Milldale, Conn.

The Houston Branch, Foxboro Co., Foxboro, Mass., has moved into a new building, 2518 South Boulevard, Houston, Texas.

The Brownell Co., Dayton, Ohio, will construct a new building at a cost of $150 000 to expand its boilermaking facilities.

A. C. Spark Plug, division, **General Motors,** will construct an addition to its present plant at Flint, Mich.

Profit experiences-

WITH **ELGIN** *Sapphire*

WEAR RESISTANT

P-121

CONTACT POINTS

Sapphire Tipt Indicator points time tested in thousands of gage installations outwear carbides — cannot scratch or mar surfaces — non-porous, hard, do not load. Standard or to your specifications — For the ultimate in dial indicator gaging accuracy use Sapphire tipt contact points and Sapphire inserted gage anvils.

P-122

SAPPHIRE STOP

Sapphire can take it — Again outwearing all other materials — This time as a "stop" in telephone relay equipment. Preliminary tests showed that Sapphire stands up the equivalent of 40 years actual life — In this instance 11,000,000 blows without wearing the Sapphire or the metal part.

P-123

HYPREZ DIAMOND COMPOUND

Save ⅓ to ½ of your finishing time. Hyprez produces any desired finish in a fraction of the time required with other materials — cleaner, easy to use, dependable, predictable results — every time. No contamination.

Use Hyprez on Carbides, Steels, Chrome, Quartz, Ceramics.

CHECK ITEM OF INTEREST — Tear out — write name on margin — mail in for descriptive literature.

ELGIN *Sapphire*

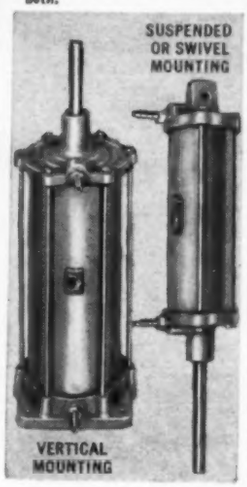
PRODUCTS DIVISION, AURORA, ILL.

ELGIN NATIONAL WATCH COMPANY

Let MEAD'S STEEL-FINGERED GIANTS

DO THAT JOB
Faster, Better, Cheaper

Get faster, more economical production set-ups—investigate the entire "family" of Mead Air-Operated devices. Do you want to move things—lift them, slide them, tilt them—or hold them firmly? Mead Air Power will do it. Do you need a delicate flexible touch—or tremendous power? Mead Air Power has both.



Besides the standard, ready-made fixtures for the application of Air Power (such as the Air Press Air Vise, Air Chuck, Air Clamp) Mead offers a wide selection of air cylinders which can be used in special jigs and fixtures. Illustrations show four types of double-acting cylinders which can be furnished in five different bores with optional lengths of stroke.

CATALOG READY

Send for copy of our new Air Power Catalog illustrating, describing many new man-and-money-saving devices.

•

MEAD SPECIALTIES CO.
4114 No. Knox Ave., Dept. MA-118
CHICAGO 41, ILL.

Precision Rod Cutting at High Speed

with the New DI-ACRO ROD PARTER

This newest member of the DI-ACRO "DIE-LESS DUPLICATING" family of Machines brings you accuracy, speed, capacity range and ease of operation fully up to the standards of DI-ACRO Benders, Brakes, Shears.

Do you require precision?—The DI-ACRO Rod Parter holds tolerance to .001″ on duplicated cuts. The ends are square, and roundness is maintained.

Do you want speed?—The Rod Parter exceeds output of other methods with equal accuracy, on rods and bars up to 5/8″. Torrington Roller Bearings incorporated in an exclusive multiple leverage arrangement provide remarkable ease of operation in both heavy and light materials.

"PARTS OFF" MANY MATERIALS

All hot and cold rolled rods
Stainless steel
Chrome Molybdenum
Aluminum Brass
Copper Bi-metals
Many types of plastics
Fibre Rubber
Wood

GET "DIE-LESS DUPLICATING" CATALOG!

Shows parts produced without die expense by DI-ACRO Benders, Brakes, Shears, Rod Parters, Notchers, Punches. Send for your free copy.

Pronounced "DIE-ACK-RO"

DI-ACRO PRECISION MACHINES DIE-LESS DUPLICATING

O'NEIL-IRWIN MFG. CO.
311 EIGHTH AVENUE • LAKE CITY, MINNESOTA

Electric Products Co., Cleveland, has appointed **Hubert Kaub & Co.**, Denver, Colo., as agents.

OBITUARY

Kirke R. Wilson

Kirke R. Wilson, 59, hydraulic press manufacturer, designer and builder of specialized automotive repair and service tools, died in Detroit Sept. 25.

Clem H. Franks, 53, president of the Teletype Corp., died at his home in Hinsdale, Ill.

Arthur E. Newman, 61, retired sales manager of the Bridgeport Wire & Cable section, General Electric Co., died Oct. 1.

Arthur H. Wyman, 65, manager of Allis-Chalmers general machinery district sales offices at Cleveland, Ohio, since 1925, died Oct. 5.

Newman Ebersole, director of purchases, Armco Steel Corp., died Sept. 22 in Cincinnati, Ohio.

Dr. William Roth Work, 67, Assistant Director of the College of Engineering and Science, Carnegie Institute of Technology, died Oct. 3.

George D. Phelps, 91, one of the first employees of Warner & Swasey Co. who retired 30 years ago, died Sept. 20.

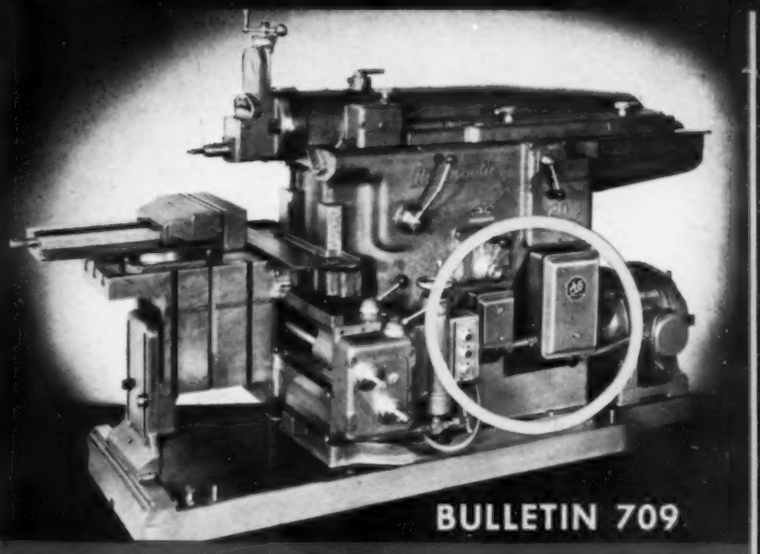
Max Israel, 75, vice president and one of the founders of Dayton Bronze Bearing Co., died Oct. 2.

Thomas F. Maher, president of the Jamestown Iron Works, Jamestown, N. Y., died Oct. 1.

Daniel E. Miller, 59, director of purchases, Carborundum Company, Niagara Falls, N. Y., died Sept. 28.

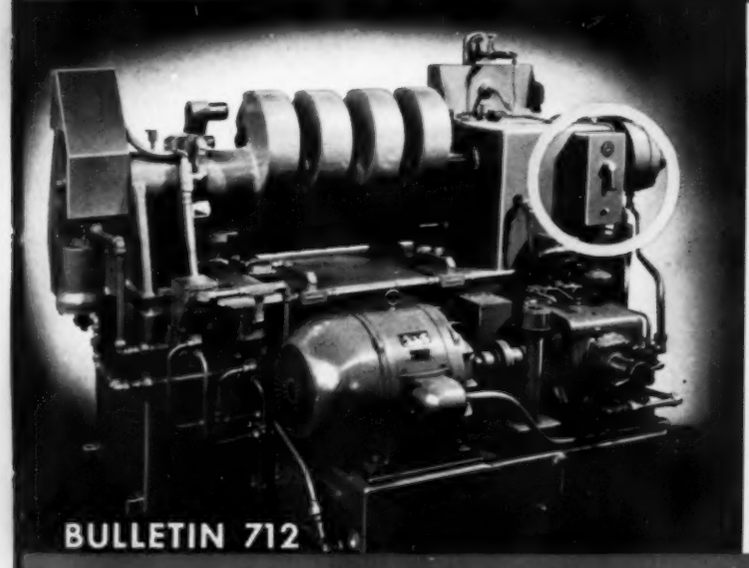
BULLETIN 609

Manual Starters



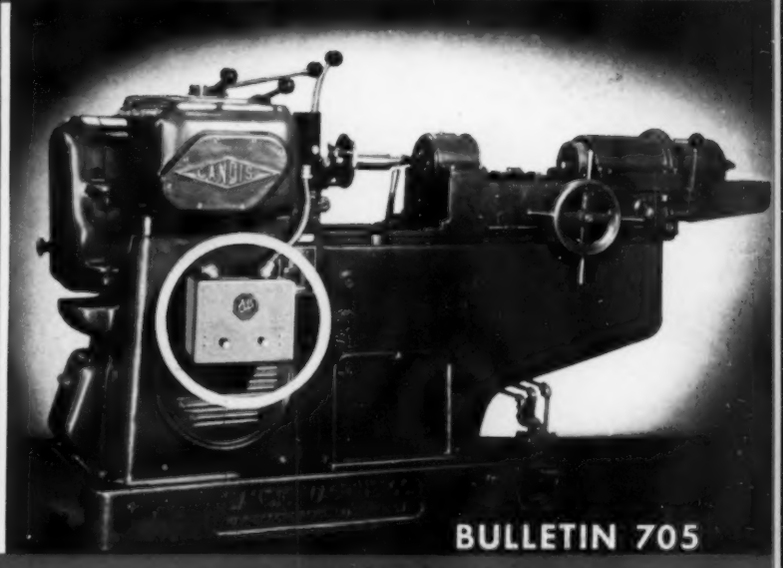
BULLETIN 709

Automatic Starters



BULLETIN 712

Combination Starters

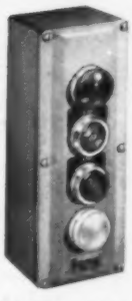


BULLETIN 705

Reversing Switches

TROUBLE-FREE Motor Controls for Every Machine Tool Requirement

This A-B name plate on motor controls is an internationally famous trademark . . . recognized by machinery buyers as the emblem of top quality in motor control. It stands for a solenoid contactor construction having only one moving part. It stands for double-break, silver-alloy contacts that never need maintenance. It stands for freedom from pivots, pins, and bearings. It stands for millions of trouble-free operations.



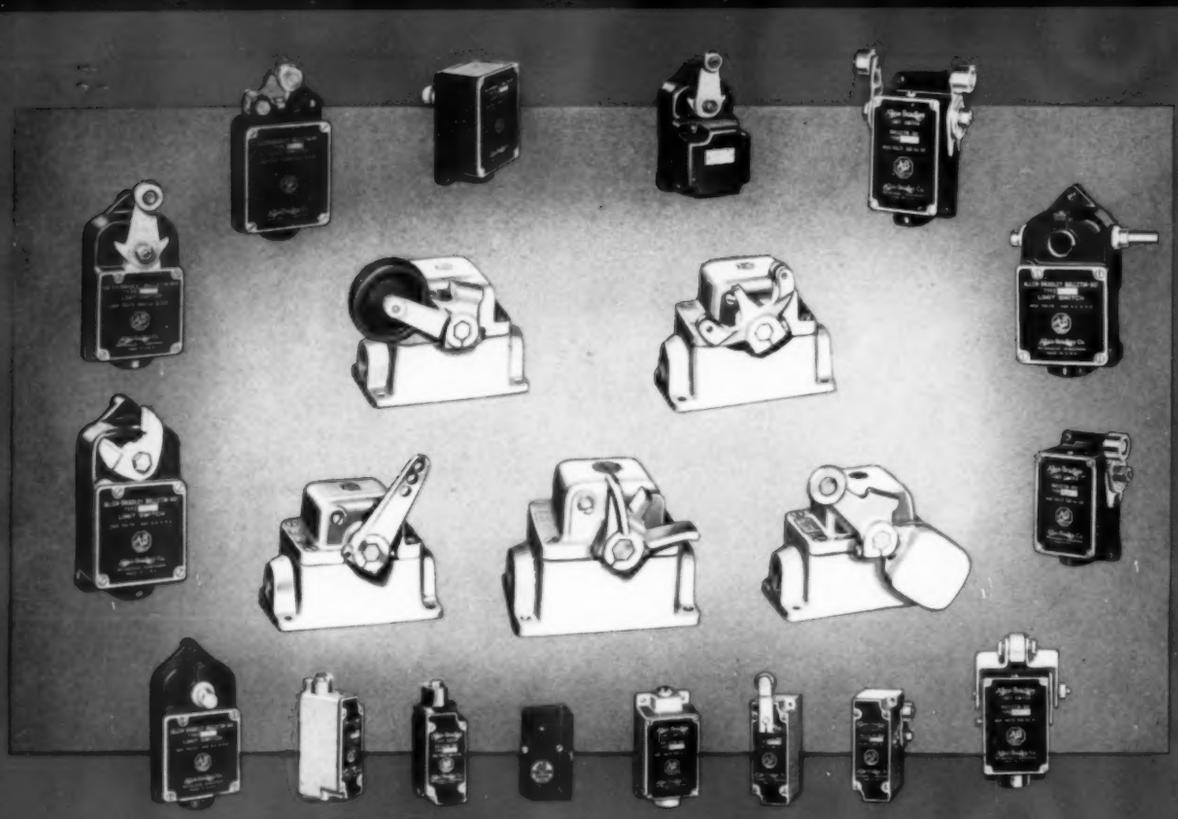
Bulletin 800T oiltight station.

You can add a valuable sales asset by equipping your machines with A-B motor controls. The A-B name plate assures you and your customers of freedom from control troubles.

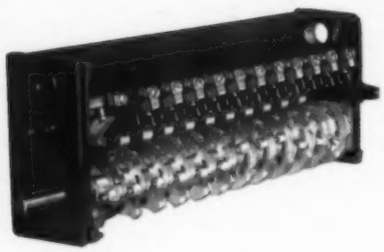
Allen-Bradley Co., 1316 S. Second St., Milwaukee 4, Wis.

ALLEN-BRADLEY

SOLENOID MOTOR CONTROL



Do you have Sequence Control Problems?



Rotating Cam Limit Switch

The new Bulletin 801 limit switch will handle from 3 to 12 circuits. Each cam independently set for position and angular travel. Double-break, silver-alloy contacts assure dependable operation.

Let Allen-Bradley Control Engineers help you select the most suitable limit switch for each application

Limit switches . . . hundreds of types and sizes in the Allen-Bradley line . . . are the "makings" of modern sequence control systems.

Some of the more popular A-B limit switches are shown above. With this big line to pick from, you can put any machine through its paces . . . step up its performance . . . and obtain the automatic sequence control you require.

If you really want to see "what's cooking" in limit switches, ask an A-B control engineer to drop in. There's no obligation . . . it's a friendly service to machinery builders who want up-to-date motor controls on their machines.

Allen-Bradley Co., 1316 S. Second St., Milwaukee 4, Wis.

A-B Quality

ALLEN-BRADLEY

SOLENOID MOTOR CONTROL

QUALITY

cleaning we can talk till we're

blue in the face

OAKITE MATERIALS
for Better Metal-Cleaning

OAKITE COMPOSITION NO. 97 for machine pre-cleaning before pre-paint treatment; electrocleaning: Dissolves, removes buffing, drawing compounds. Details in Report 8153

OAKITE COMPOSITION NO. 92 for steam cleaning: Detergent action removes grease and dirt quickly. No toxic vapors. Free-rinser. Details on request.

OAKITE COMPOSITION NO. 90 for electrocleaning: Wets, emulsifies, loosens dirt and oils. Fine bubble blanket traps troublesome spray. FREE data on request.

OAKITE COMPOSITION NO. 3 for burnishing: Superior lubrication; thick suds; free rinsing. Facts on this and barrel cleaning in FREE Report 6705.

OAKITE CRYSCOAT to condition ferrous metals for paint, lacquer: Thoroughly removes soils, leaves inert phosphate film that holds paint. Details in FREE Report 6731.

FREE OAKITE SERVICE REPORTS!

Check those you want. Clip and send with your name and address to

OAKITE PRODUCTS, INC.
30H Thames Street, New York 6, N.Y.

WE could use up a lot of words telling you how good Oakite cleaners are. How much money you stand to save using Oakite cleaning methods. How many benefits Oakite in-plant service gives you.

And we could brag about our free informative literature, our free blueprints for building and installing modern cleaning equipment. We could mention the fact that we issue, on loan, various controllers for maintaining proper cleaning solution strength and temperature . . . that we supply our customers with dispensing devices to help stretch cleaning supplies.

We could tell you that we've been in this cleaning business for nearly 40 years. We could tell you all these things—and be telling the truth. But words are cheap; that's why we'd rather act than talk. Let us prove, on your tough or routine cleaning problems, that our actions speak louder than words.

Technical Service Representatives in Principal Cities of U. S. & Canada

MATERIALS
METHODS
SERVICE

OAKITE
REG. U. S. PAT. OFF.

Specialized Industrial Cleaning
MATERIALS • METHODS • SERVICE

It STAYS CLEANER LONGER...

See why the

C-W SEALEDPOWER

TOTALLY-ENCLOSED....FAN-COOLED MOTOR

SAVES 80% OF MAINTENANCE COSTS

COMPARE CLEANING COSTS!

	Conventional* Fan-Cooled Motor VS C-W Sealedpower Motor — Normal (Not Extra Dirty) Service	
FREQUENCY	**EVERY YEAR** a conventional fan-cooled motor requires cleaning, in the opinion of experienced maintenance chiefs.	**ONCE EVERY 3 YEARS** is often enough for a Sealedpower motor, according to those who have had experience with it.
OPERATIONS REQUIRED	**17 OPERATIONS**—to shut down, dismantle, clean and reassemble motor. Motor must be shut down and taken out of production, for about 3 hours.	**NO NEED TO SHUT DOWN** in normal—not extra dirty—duty, no need to remove fan cowl, etc. Brushing cowl end, and cleaning outside of motor is sufficient.
TIME, LABOR COSTS	**$4.95** **3 HOURS** time, estimated by motor maintenance men, at union scale of $1.65 per hour, totals $4.95 yearly per motor, in normal service.	**14¢** **¼ HOUR** time, once every 3 years, cleans a Sealedpower motor. At $1.65 per hour, cleaning cost per year is only 14¢.
COSTS IN ABNORMAL SERVICE	**EVERY 3 MONTHS,** a conventional motor, operating where dirt or lint is excessive, should be cleaned. That requires 18 hrs. of labor at $1.65, for a total cleaning cost of $29.70 per motor, during an interval of 18 months.	**ONLY ONE** cleaning every 18 months keeps a Sealedpower motor running cool and efficiently. Only ¾ hour to remove fan cowl, brush fan and outside of motor and replace cowl. A labor cost of only $1.24 per motor.

**A totally-enclosed, fan-cooled motor, of conventional design, was used for comparison*

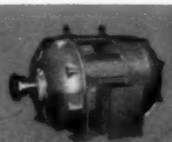
You get this *dollar-saving design* only when you specify C-W Sealedpower Motors. No other totally-enclosed, fan-cooled motor has exterior cooling, with the fan-driven airstream blowing over the finned frame, carrying dust and fumes *outside* and *away*. It beats rust and corrosion, too, because the frame is rugged *cast iron*.

RATINGS FROM 3 TO 60 HP, horizontal or vertical, with NEMA "C" or "D" flange mountings. Many ratings are stocked . . . see C-W's weekly Stock Sheet. Talk over your motor needs with a Crocker-Wheeler representative.

FOR ANY APPLICATION WHERE EXCESSIVE MAINTENANCE IS INDICATED
—specify SEALEDPOWER and SAVE

Protected-Type Motors

Sealedpower Motors



Wound Rotor Motors

Direct Current Motors

Generators

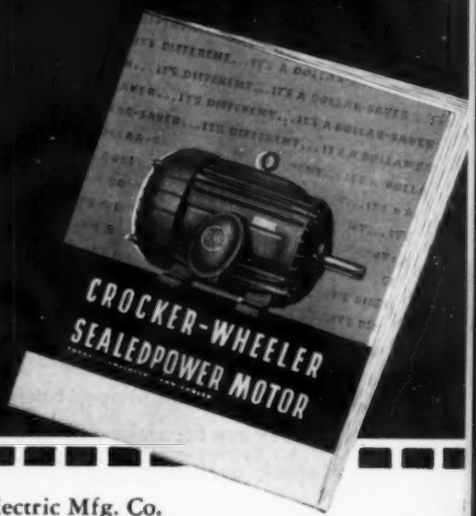
Flexible Couplings

It SKIPS SHUTDOWNS

150% MORE COOLING SURFACE
is provided by the radiating fins, exclusive with the C-W SEALEDPOWER. Here, fluttering streamers trace the fan-driven airstream that blows dust and fumes outside and away.

CROCKER WHEELER
ELECTRIC MANUFACTURING COMPANY, AMPERE 3, N. J.
A Division of The Joshua Hendy Corporation

Branch Offices:
Boston, Buffalo, Chicago, Cincinnati, Cleveland, Los Angeles, Milwaukee, New York, Philadelphia, San Francisco, Pittsburgh, Washington, D. C.—
Representatives in principal cities.



Before You Buy ANY totally-enclosed motor, be sure to read why SEALEDPOWER will prove a "maintenance miser" for you. This new booklet, "It's Different—it's a Dollar-saver," is packed with facts no savings-minded motor user can afford to overlook. Write for it.

Crocker-Wheeler Electric Mfg. Co.
Ampere 3, N. J.

Send the SEALEDPOWER Motor Booklet, *"It's Different—it's a Dollar-Saver"*.
AM-1148

Name.....

Title or Function.....

Company.....

Address.....

For double the life...

New TAFT-PEIRCE Reversible PLUG AND THREAD GAGES

In this new style of thread and cylindrical plug gages, Taft-Peirce offers highest accuracy *plus the economy of reversible gaging members.*

Whenever one end of a plug shows wear you merely unlock the handle, reverse the plug and lock it back in place. Length may be adjusted as desired. The positive locking action of the handle prevents slipping and gives these gages a rigidity equivalent to a solid gage.

Taft-Peirce Reversible Cylindrical Plug Gages (AGD Standard) are available in sizes from .025" to .510" inclusive both GO and NOT-GO. They are furnished in alloy steel, high speed tool steel, carboloy or chromium plated.

Taft-Peirce Reversible Thread Plugs, GO and NOT-GO, are available in sizes ranging from No. 0 to ½" in both National Coarse and National Fine series. Steel only.

For additional information on these new Reversible gages write: The Taft-Peirce Mfg. Co., Woonsocket, Rhode Island.

THE TAFT-PEIRCE MFG. CO.

Use Taft-Peirce Gages for every gaging need

ROTARIES IN KITS

make neat presentations to "honor" men

Standard Kit No. 40
— 5 Burs and 5 Files with ¼" shank.

Standard Kit No. 88
— 18 Burs with ⅛" shank.

OTHER ASSORTMENTS AVAILABLE

• With an eye toward building employee good will, many industrial managements make a practice of extending "token recognition" for outstanding service. A kit of Nicholson Rotary Files or Burs makes a fine — and a useful — personal gratuity.

From the following available stocks, your industrial distributor can supply such kits in various standard or special assortments.

HIGH SPEED STEEL—¼" SHANK—*Hand Cut Rotary Files* (used principally on ferrous metals and any scaly, tough, dense surface) come in 16 standard shapes and 3 degrees of coarseness. *Ground-from-Solid Burs* (used principally for non-ferrous metals and other soft materials) come in 16 standard shapes and 3 degrees of coarseness.

CARBIDE—¼" SHANK—*Ground Bur* type only. Made in 9 standard shapes and 3 degrees of coarseness. With up to 100 times the wearing qualities of high speed steel, Carbide Burs are used principally on long production runs. These Carbides will also cut efficiently on materials such as hardened tool steel.

HIGH SPEED STEEL—⅛" SHANK—*Hand Cut Rotary Files* and *Ground Burs*. Each type available in 18 standard shapes, similar to ¼" line, and one degree of coarseness. These files are for relatively delicate work.

NICHOLSON FILE CO. • 97 ACORN ST., PROVIDENCE 1, R. I.
(In Canada, Port Hope, Ont.)

NICHOLSON ROTARY FILES

NICHOLSON U.S.A.

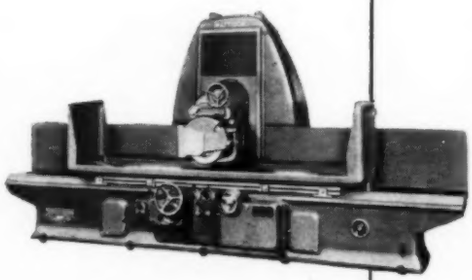
HAND CUT AND MACHINE GROUND • HIGH SPEED STEEL AND CARBIDE

Grinding Locomotive Side Rods

on MATTISON GRINDER

This illustration shows a locomotive side rod being accurately ground on a Mattison Grinder. Grinding provides a flat surface for locating boring operations and permits checking alignment of rod while on locomotive. In addition to side rods, the Mattison Grinder handles a variety of other parts for railroad shops such as links, crosshead guides, reverse guides, valve guides, reverse valve parts, front and back engine guides, etc.

In all sizes from 12" to 36" wide to 192" long, Mattison Grinders are ruggedly and accurately built to do high-powered precision grinding. It is possible to grind one large part or many small parts with equal speed and facility. To determine what Mattison Grinders can do for you, send us blue prints of your work for production estimates.



Write for Free Set-Up Book showing how others have reduced time and cut costs with Mattison Grinders.

MATTISON MACHINE WORKS

ROCKFORD · ILLINOIS

Saves $1,200 a year on "Crack-the-Whip" Drive

"Cracking the Whip" is fun for the riders of a Pennsylvania Amusement Park, but it's one of the toughest drive applications. The fast starts, rapid accelerations and sudden stops cause ordinary belts to slip . . . burn and wear through.

Take the case of this Park Owner. During the 1946 park season, his "Whip" wore out 3 of the 40-foot, original-type belts. He had to replace them at a cost of $400 each.

Then he called the Dayton V-Belt Distributor. His problem was studied. The power, speed and space limitation analyzed. Recommendation: Use the old wood—flat driven pulley, install standard Dayton V-Belts and Dayton Motor V-Pulleys. Nothing "special" required. Result: After two years, no slippage, no burning, no wear through. $1,200 a year saved.

When it comes to transmitting power, Daytons can do it better and save you money. Your local Dayton V-Belt Distributor has specialized knowledge and complete stocks.

For a better, more profitable solution to your drive problem, call your local Dayton V-Belt Distributor.

THE DAYTON RUBBER COMPANY

Main Office and Factory: Dayton 1, Ohio

Branch Offices: Atlanta, Boston, Chicago, Cleveland, Dallas, Detroit, Los Angeles, Minneapolis, New York, Philadelphia, St. Louis

V-Belt Buyers! A leading mill supply house near you offers specialized Dayton V-Belt service. Look for the name under the trade name heading "Dayton V-Belts" in the yellow pages of your telephone directory.

Dayton Rubber

THE MARK OF TECHNICAL EXCELLENCE IN NATURAL AND SYNTHETIC RUBBER

STANDARD

Comparator DIAL SNAP GAGES

The efficiency of the STANDARD Dial Snap Gage is evidenced by the continual flow of repeat orders in large lots. Its simple, functional design, light weight, sturdiness and sustained accuracy, coupled with reasonable price have earned gratifying popularity in the most exacting plants. THIN . . . for use in narrow places; LIGHT . . . reducing the fatigue factor; PRECISE . . . easy to use, by the novice or expert, at bench or machine . . . and DEPENDABLE, ALWAYS!

1⅛" BEZEL

Small, light in weight, yet reading in .0001" with ease and proven precision.

SHOCKPROOF MECHANISM

STANDARD Shockproof construction absorbs shocks of sudden impacts without the slightest sacrifice of accuracy; assures high degree of consistent repeatability.

DIRECT ACTION

Plunger acts directly on indicator spindle, without intervention of levers; simple, dependable, avoiding loss of accuracy.

LONG LIFE ANVILS

Flat lower pin is tipped with tungsten carbide disc. Upper pin, as regularly supplied, has spherical surface, tungsten carbide tipped. If desired, gages can be furnished with two flat pins, lapped parallel, set and sealed.

Available in 8 sizes, each with range of 1". Design differs slightly with size, but accuracy is identical. Smaller sizes may be used in stands as comparators.

INSULATED GRIPS

Comfortable grips are heat-insulated from gage body to prevent hand warmth from affecting accuracy.

WRITE FOR COMPLETE INFORMATION

STANDARD GAGE CO., Inc., Poughkeepsie, N.Y.

How industry makes multiple savings with Gulf Quality Oils and Greases:

Revolutionary QUENCHING OIL *cuts heat treating costs*

For proper hardening of many types of steel, fast cooling is required. Water, however, may be too fast—often causes distortion and cracking.

After years of extensive research on this problem, Gulf technologists developed Gulf Super-Quench, a revolutionary quenching oil that has a much faster cooling rate than conventional quenching oils, but shows no greater tendency to cause distortion and cracking.

Typical of reports on the outstanding performance of this remarkable quenching oil is one from the Chief Metallurgist of a large machine tool plant: "When we used a conventional quenching oil, we had difficulty in getting the minimum hardness specified for our gears. With Gulf Super-Quench we consistently average well above the required hardness. Super-Quench has also made possible a big reduction in cleaning time, thus reducing our cleaning costs."

Gulf Super-Quench is one of more than 400 Gulf quality oils and greases that are helping plant operating men make multiple savings through improved production and lower costs. Make sure your plant is getting the advantage of all recent developments in petroleum science. Write, wire, or phone your nearest Gulf office today and ask a Gulf Lubrication Engineer to call.

Gulf Oil Corporation · Gulf Refining Company

Division Sales Offices:

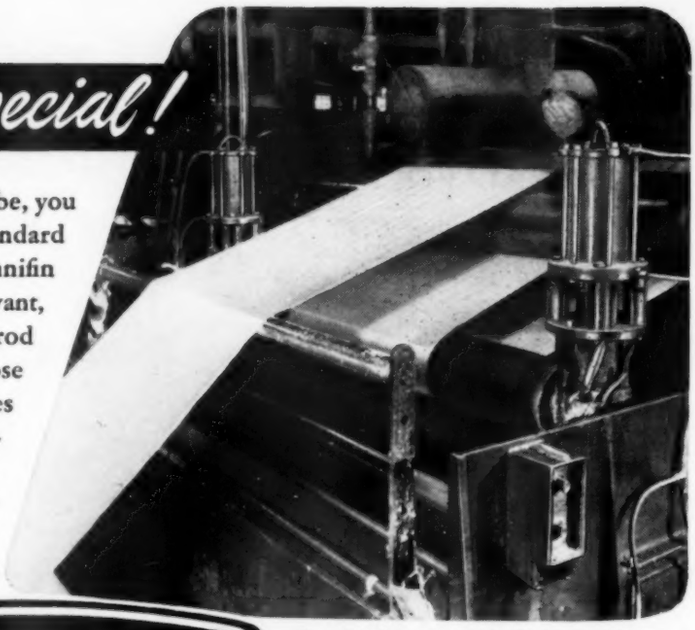
Boston · New York · Philadelphia · Pittsburgh · Atlanta
New Orleans · Houston · Louisville · Toledo

GULF INDUSTRIAL LUBRICATION

Helps make machines produce more at lower cost

NO JOB TOO *Special!*

NO matter how special your requirements may be, you can meet virtually any need right out of the standard line of Hannifin cylinders. This is because the Hannifin line is COMPLETE! Any length stroke you want, double or single acting. Cushions for head end, rod end, or both. Ten standard bore diameters to choose from, ranging from 1" to 12". Larger or special types on order. All built to Hannifin's standards for quality: cylinders TRU-BORED and honed . . . rods ground and polished . . . all parts precision-made for complete interchangeability. Ask for engineering recommendations. Catalog on request.

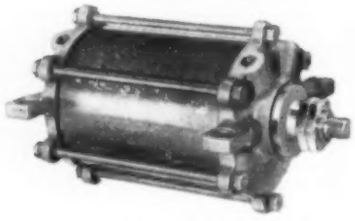


Hannifin flange mounted cylinders applying pressure on roll. Hammersley Mfg. Co., Garfield, N. J.

HANNIFIN

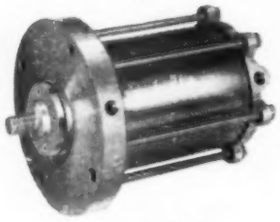
PNEUMATIC CYLINDERS

Tru Bored HONED



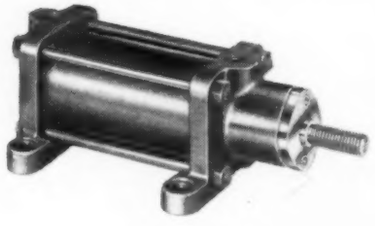
SERIES R

Series "R" Leakproof Cylinders feature the exclusive external packing adjustment design developed by Hannifin for positive assurance against air leakage and increased convenience in maintenance. Unexcelled for freedom from friction and high sustained efficiency. Sizes 3" to 12" bore. Any length stroke. 6 basic mounting styles, plus a wide variety of combination styles and double end piston rod models.



SERIES LW

SERIES "LW"— Hannifin Series "LW" Pneumatic Cylinders, featuring cup type piston packing, are preferred by many experienced engineers for their simplicity . . . economy . . . smooth operation. Six standard sizes from 3" to 12". Any length stroke specified. Built in standard clevis, foot, base, trunnion, flange, and center line mounting styles. Also offered in a variety of combination and double end piston rod models.



SMALL BORE

Developed by Hannifin to meet the need for high quality 1", 1½", 2", and 2½" bore cylinders. Built with "LW" cup type piston construction: Six standard mounting styles. Any stroke desired. Also offered in combination and double end piston rod styles. In all Hannifin cylinders, standardized construction makes for lower engineering costs and quicker delivery. *For unquestioned dependability, standardize on Hannifin.*

A New Electric AIR CONTROL VALVE

- **PUSH BUTTON CONTROL.** The modern way to operate air cylinders and other air powered equipment. Provides for 3-way or 4-way air flow.
- **POSITIVE, POWERFUL.** "Packless" construction; corrosion proof. Slide type, pilot operated, solenoid controlled.
- **FAST CYCLING.** Capable of 180, or more, cycles per minute. Ideal for working out automatic controls with limit switches, etc.
- **SIZES.** ⅜", ½", ¾", and larger. Send for descriptive literature and engineering recommendations.

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Wheel Guides • Separate Coolant Tank • Five Inch Wheel Flange • Automatic Work Stop • Automatic Coolant Pump Operation • Instantaneous Electro-Hydraulic Automatic Work Clamp

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MODEL 223

ACCO

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CAMPBELL
Abrasive Cutters and Nibbling Machines

WHEN CORROSION RESISTANCE AND HIGH STRENGTH ARE ESSENTIAL . . .

Tuf-Stuf

IS OFTEN THE SOLUTION

TUF-STUF is the Mueller Brass Co. trade name for Aluminum Bronze. It is furnished in a series of five different alloys, depending upon the purpose for which it is intended.

PROPERTIES

The outstanding properties of TUF-STUF are wear resistance—corrosion resistance—high strength over a wide range of temperatures (sub-zero and elevated)—high brinell hardness on the heat treatable type of alloys—ability to withstand shock—high compressive strength and resistance to fatigue—lighter in weight than other copper base alloys.

SOME OF THE MANY APPLICATIONS OF TUF-STUF

Gears • Worm Wheels • Bushings • Bearings • Lead Screw Nuts • Valve Seat Inserts and Spark Plug Inserts in airplane engines • Shifter Forks • Valve Stems • Rocker Arm Bushings • Tie Rods, Nuts, and Washers for pickle tanks • Window Bolts • Parts in contact with steam, brine, sea water, weak acids and alkalis, crude oils, disinfectants, plant sprays.

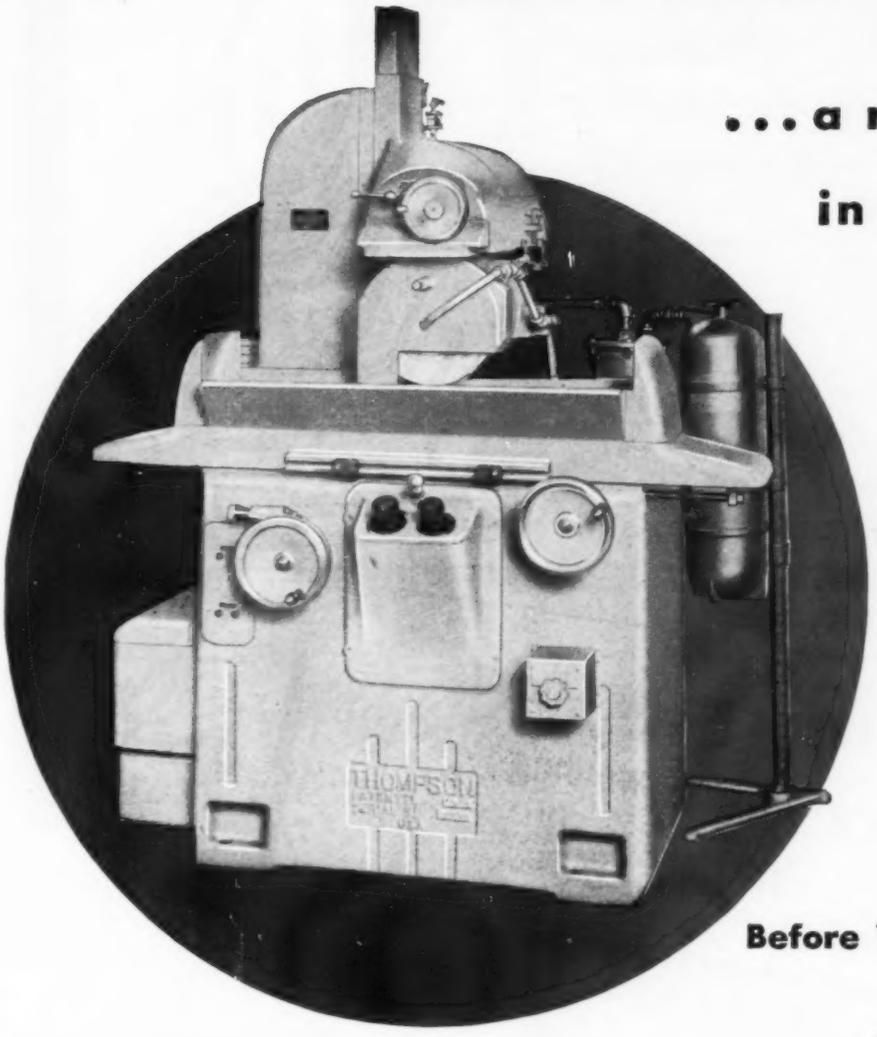
TUF-STUF Alloys are not susceptible to corrosion cracking. TUF-STUF Alloys are furnished in the form of forgings, rods and screw machine parts.

If you have a metal problem, TUF-STUF may be the answer. Let us send you complete literature on all Mueller Brass Co. alloys with their physical and chemical properties and uses. Write for catalog 3-A.

MUELLER BRASS CO.
PORT HURON, MICHIGAN

COOLANT THROUGH WHEEL

GREATLY IMPROVES GRINDING METHODS



. . . a new development in surface grinding by THOMPSON

Now you can grind very thin sections without burning and warpage.

Before You Buy

Investigate

Thompson provides a full range of machine sizes from 6" x 18" to 36" x 240" utilizing the new principle of applying coolant to the grinding wheel. The new Thompson Type "F" Hydraulic Surface Grinder with coolant through the wheel is shown above. All of the coolant is applied through the grinding wheel, making it possible to grind exceedingly thin sections without burning or warping the work.

Very fine finishes are obtained to extremely close dimensions. An outstanding advantage of this patented process is gained in grinding blanking dies and other metal cutting or shearing tools. No amorphus metal is present after grinding. This increases the life of the tool between grinds.

WRITE TODAY **for details of this new process and for information on ways it can save you production time and money! Address Dept. 10, The Thompson Grinder Company, Springfield, Ohio.**

SEE OUR NEW 32 PAGE CATALOG IN SWEETS, OR WRITE FOR COPY.

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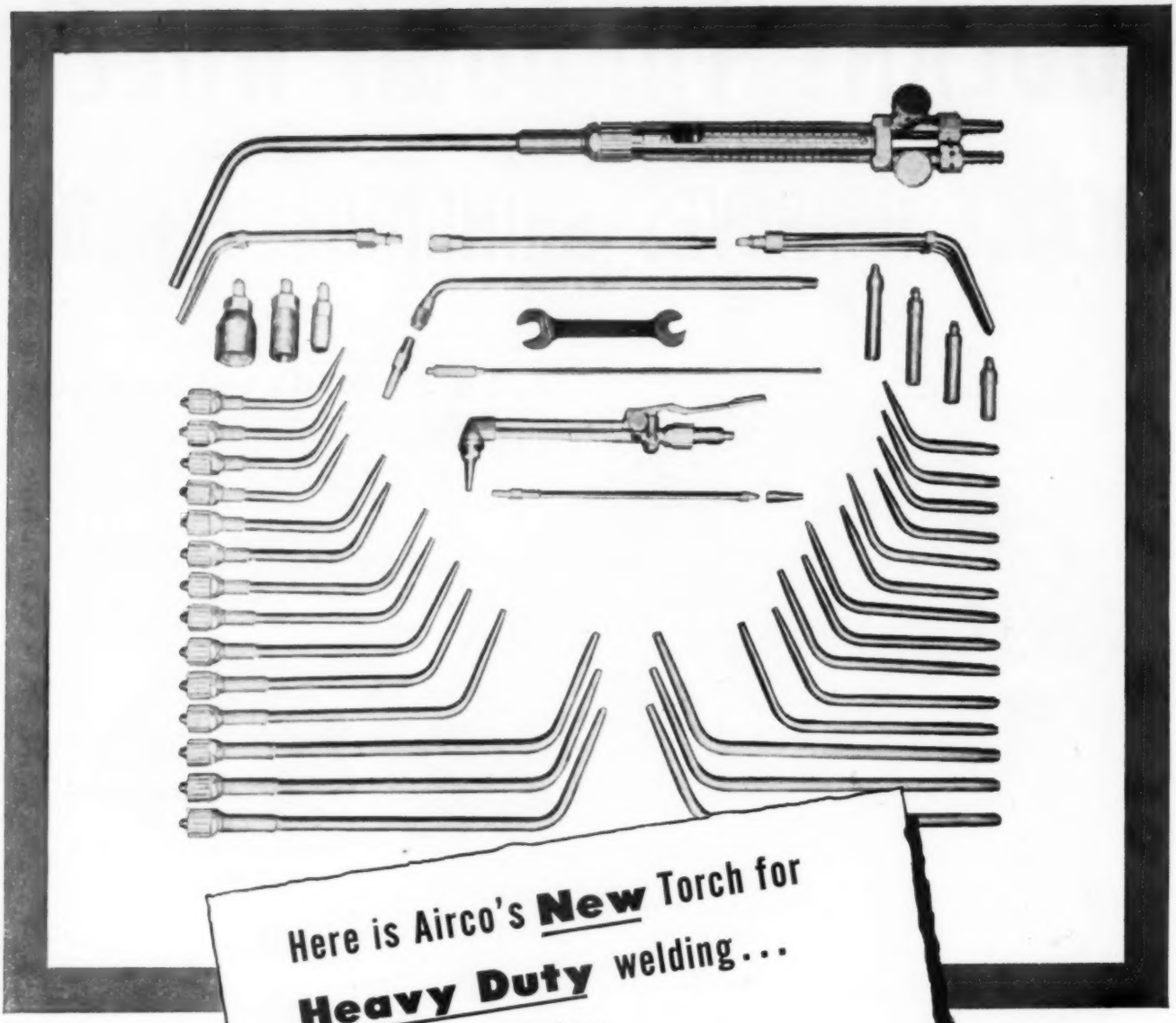
Thompson SURFACE Grinders



Here is Airco's **New** Torch for **Heavy Duty** welding... heating... brazing

The new Airco 800 Torch is designed for tough, *heavy-duty* jobs. As shown in the illustration, the torch operates with a complete range of welding tips (with or without individual mixers) as well as heating, brazing and a variety of tips for other uses. No other torch can offer this wide operating range.

The torch head is of durable, long-wearing monel metal; thus fewer torch head replacements, and lower maintenance costs result. The general design of the new Airco 800, plus flexible 1/4" or 5/16" I.D. hose, assures perfect balance and ease of manipulation . . . lowered operator fatigue.

With the addition of a cutting attachment, the Airco 800 is easily converted to handle general shop cutting work.

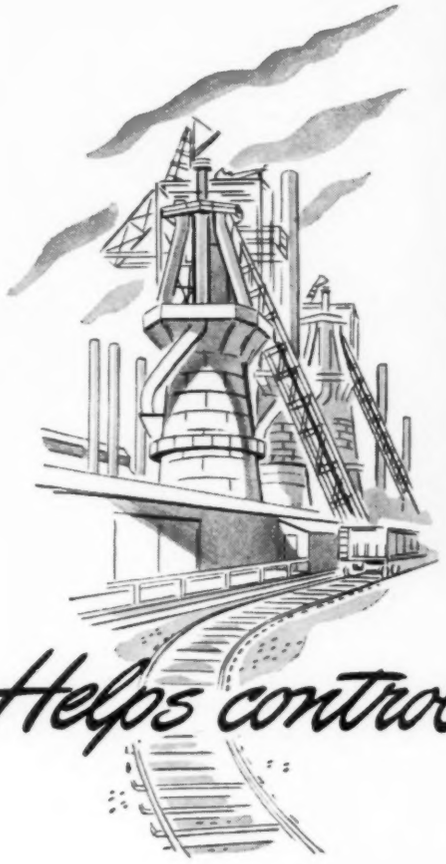
If you would like more information about this torch, or a FREE demonstration right in your own shop, address Dept. AM-8471, Air Reduction, 60 East 42nd Street, New York 17, N. Y. In Texas: Magnolia Airco Gas Products Company, Houston 1, Texas. On West Coast: Air Reduction Pacific Company, San Francisco 4, California.

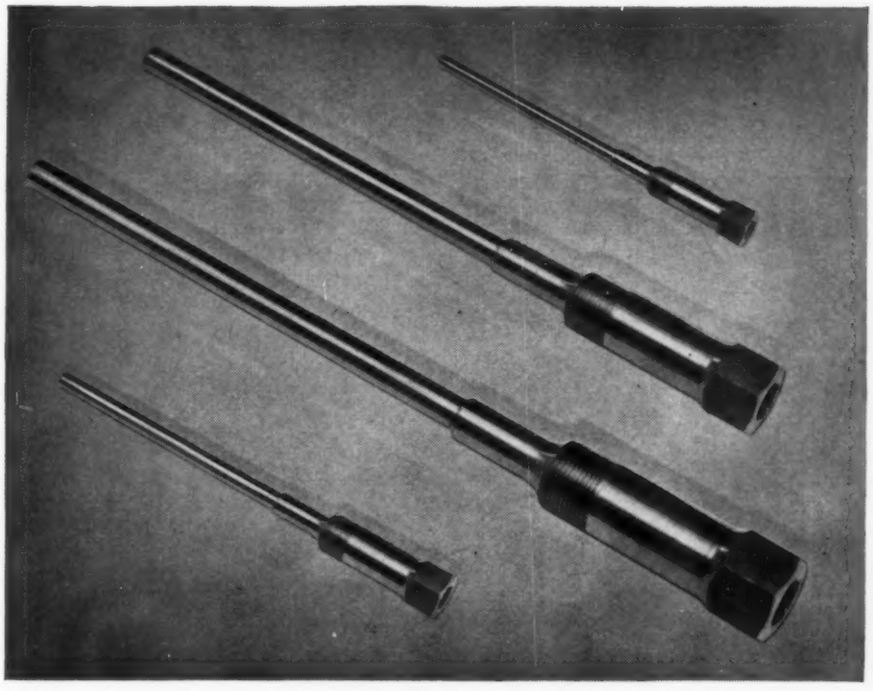
AIRCO **AIR REDUCTION**

Offices in All Principal Cities

Headquarters for Oxygen, Acetylene and Other Gases . . . Carbide . . . Gas Welding and Cutting Machines, Apparatus and Supplies . . . Arc Welders, Electrodes and Accessories

Free-Machining
ENDURO STAINLESS STEEL





Helps control heat-and parts costs, too

Inserted directly into blast furnace and kiln walls, drilled wells serve as retainers for thermocouples which pass vital operating data along to electronic pyrometers. While heat resistance is fundamental in the choice of Republic ENDURO Stainless Steel for parts such as these, *uniform machinability* ranks equally important . . . wells are turned, threaded, drilled to within ½" of their length, chamfered and tapped.

ENDURO Cold Finished Bars consistently improve the percentage of perfect pieces in stainless steel machined parts of all types. And, their *close tolerances, accuracy of section, uniform soundness, fine surface finish* and *high machinability* allow you to drive unit costs to rock-bottom levels.

Whether your product requires machinability plus heat resistance—or machinability plus eye appeal, ease of cleaning, sanitation, long life, and freedom from rust and corrosion—it will pay you to investigate all the advantages of ENDURO Stainless Steel. Current deliveries are prompt in both cold finished and hot rolled bars . . . and in wire. Write for full information.

A VALUABLE AID FOR MACHINISTS

It's a handy Speed and Feed Selector to help you in machining stainless steel. Send for one TODAY...it's FREE.

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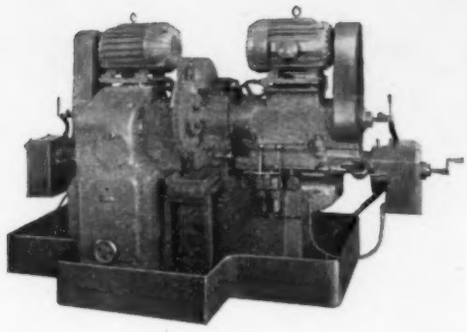
Republic ENDURO
FREE-MACHINING
STAINLESS STEEL

REPUBLIC STEEL

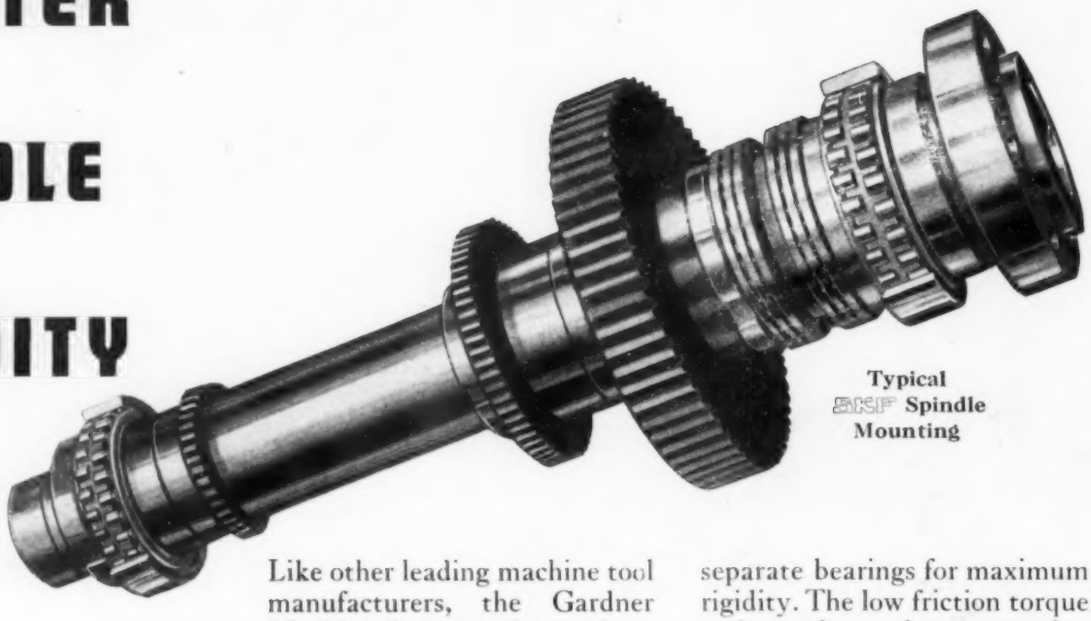
Other Republic Products include Carbon and Alloy Steels—Pipe, Sheets, Strip, Plates, Bars, Wire, Pig Iron, Bolts and Nuts, Tubing

Gardner

gets GREATER SPINDLE RIGIDITY by using SKF MACHINE TOOL BEARINGS



● *Disc Grinder built by Gardner Machine Co.*



Typical SKF Spindle Mounting

Like other leading machine tool manufacturers, the Gardner Machine Company knows from long experience that the SKF Spindle Mounting assures:

1. Rigidity
2. Repetitive accuracy
3. Uniformity of finished work

Send for new 60-page Catalog No. 272-A

These are the "big three" factors on all machine tool spindles. The radial and axial loads are absorbed by separate bearings for maximum rigidity. The low friction torque and resultant low operating temperature eliminate the need for bearing adjustment.

Although the SKF Spindle Design may cost slightly more initially than other designs, it costs far less to use. After all, it's performance in relation to purchase price that counts.

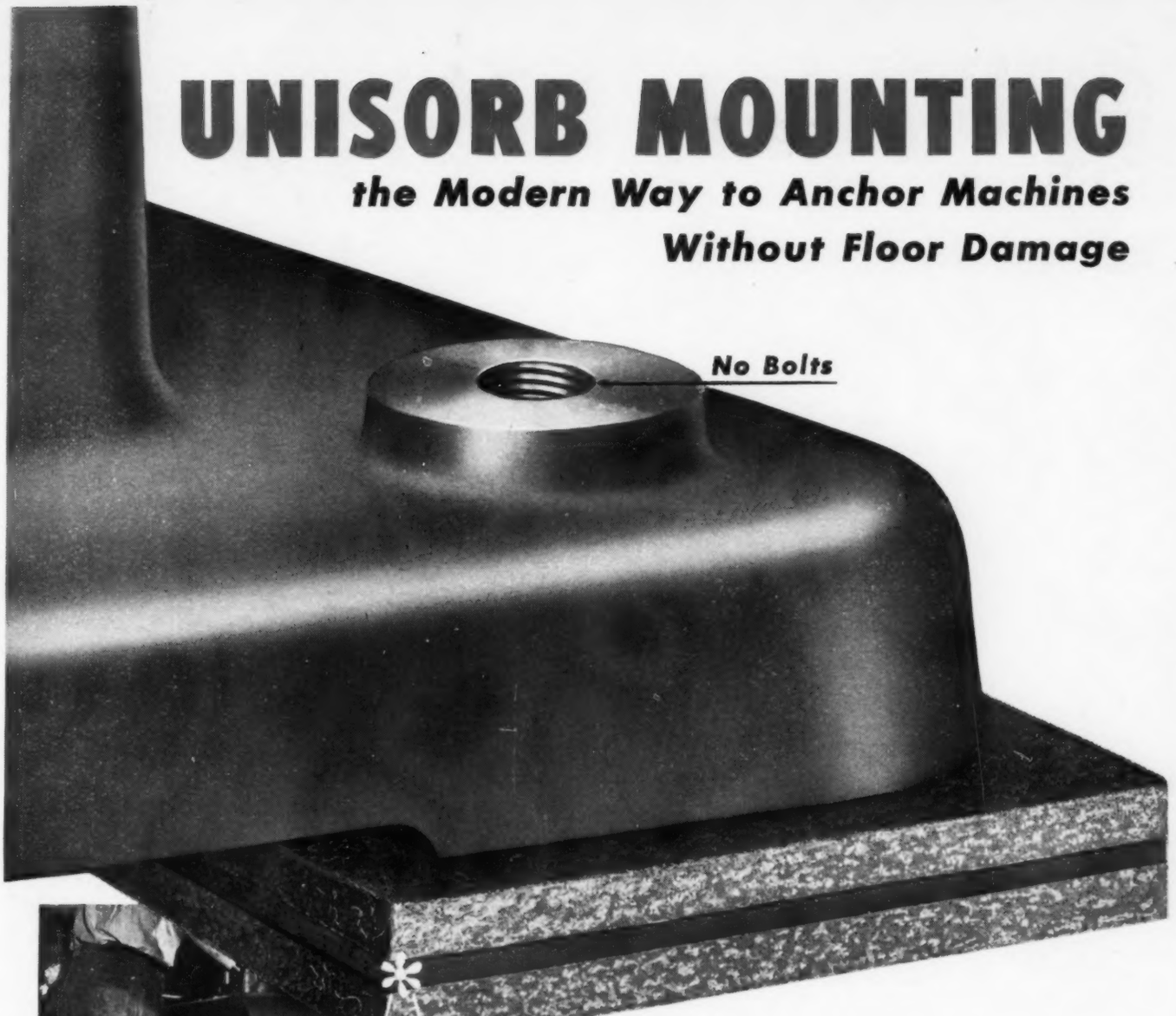
6509

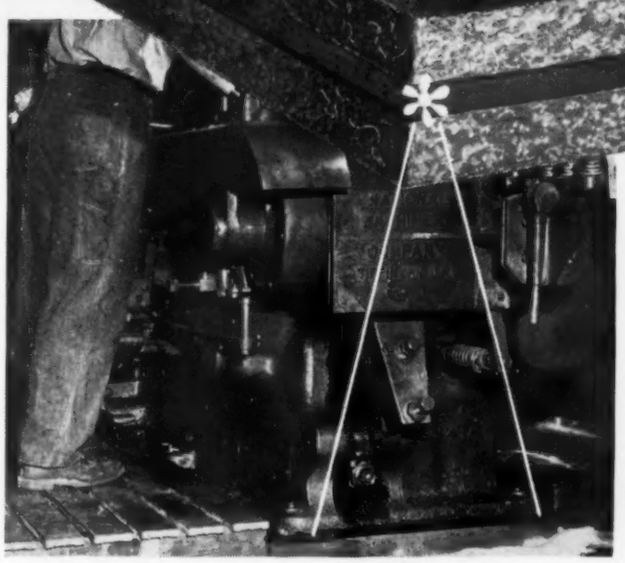
SKF INDUSTRIES, INC.
PHILADELPHIA 32, PENNSYLVANIA

SKF
BALL & ROLLER BEARINGS

UNISORB MOUNTING

the Modern Way to Anchor Machines Without Floor Damage

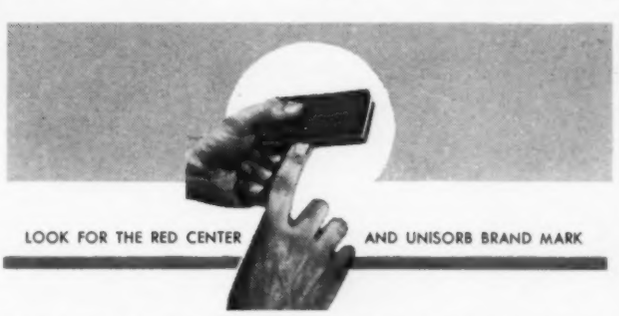




Almost every kind of machine can be anchored the modern way — on UNISORB . . . *on flooring of any type.* No bolts. No lag screws. No destructive floor drilling.

A special cement binds the UNISORB pads to the machine feet and the floor with a holding strength of 1500 lbs. per square foot minimum, which absolutely prevents riding.

Besides providing the easiest of all machine installation methods, UNISORB absorbs from 60% to 85% of transmitted vibration and noise. Write for a sample and details now.



THE FELTERS COMPANY

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Offices: New York, Philadelphia, Chicago, Detroit
Sales Representatives: San Francisco, St. Louis
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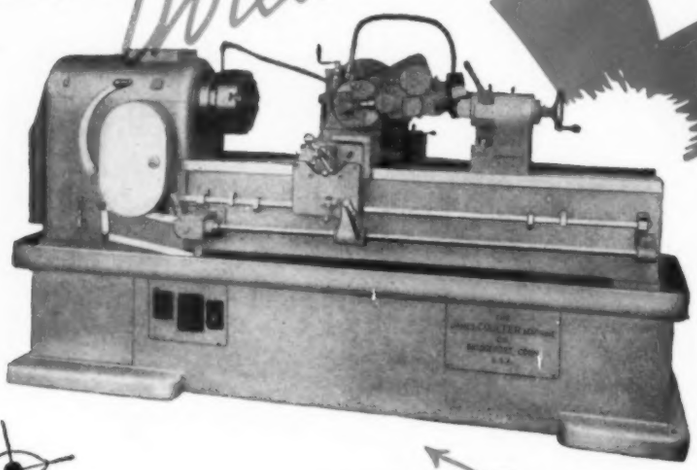
PRESENTING THE NEW COULTER *Threadmaster*

CHECK and COMPARE



MORE DEPENDABILITY

Anti-Friction Bearings and Spiral and Worm Gears in Cutter Spindle Drive.

MORE EFFICIENCY

Full-size spindle and balance wheel on both ends of cutter spindle drive.

MORE CAPACITY

59 speed changes possible with standard equipment. Cut threads from 1/3 to 20 per inch and diametral leads from 7 to 20 in single, double and triple worms, and leads from .050 to 3.000.

MORE ACCESSIBILITY

All speed and feed changes within easy reach of operator for quick change over.

MORE PRODUCTION

Mill hard and soft materials with carbide tools.

These are reasons enough why you need the Coulter THREADMASTER . . . the Thread Milling Machine of tomorrow . . . threading it better and faster, today!

the James COULTER Machine Co.

Here at last! The conventional type Thread Milling Machine that produces long and short precision traversing, elevating, cross-feed and lead screws in LESS TIME!

Get the whole story today ••• then CHECK and COMPARE. It's COULTER all the way!

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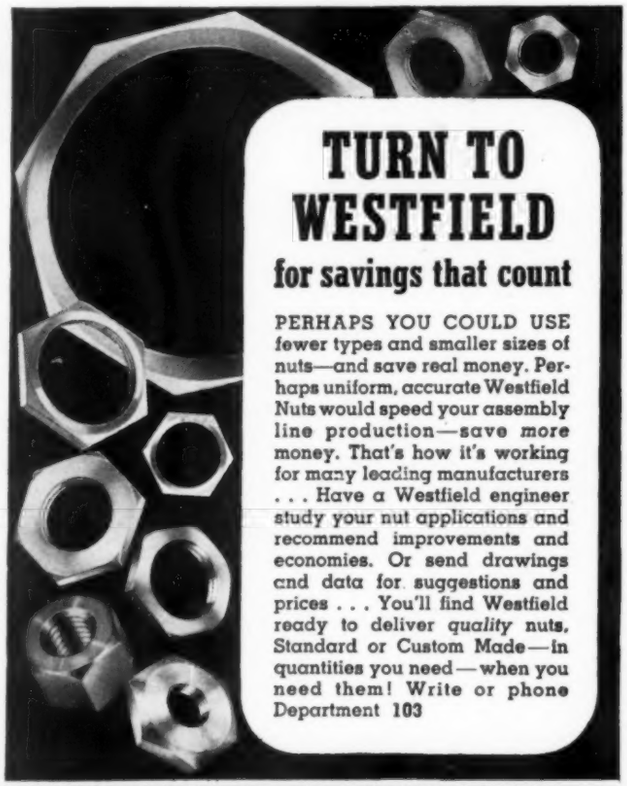
ECONOMY

THE W&B CO

ECONOMY Lubricant 1888
fluid type - water soluble
For Grinding and Cutting

Keener grinding
Cleaner machines
Longer wheel life

THE WHITE & BAGLEY COMPANY
WORCESTER, MASS. • DETROIT, MICH.
Originators of Grinding Lubricants



TURN TO WESTFIELD
for savings that count

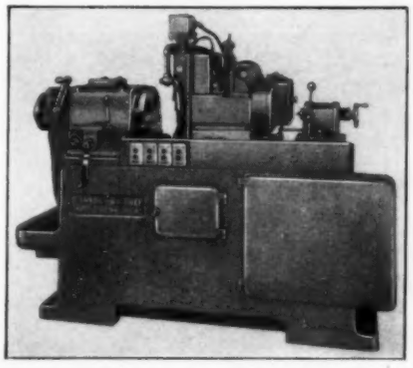
PERHAPS YOU COULD USE fewer types and smaller sizes of nuts—and save real money. Perhaps uniform, accurate Westfield Nuts would speed your assembly line production—save *more* money. That's how it's working for many leading manufacturers . . . Have a Westfield engineer study your nut applications and recommend improvements and economies. Or send drawings and data for suggestions and prices . . . You'll find Westfield ready to deliver *quality* nuts, Standard or Custom Made—in quantities you need—when you need them! Write or phone Department 103

WESTFIELD METAL PRODUCTS CO. INC.
WESTFIELD, MASS.

New Hanson-Whitney Semi-Automatic Thread Grinder

For uninterrupted high speed, lower cost grinding of external threads, Hanson-Whitney introduces this important new machine.

Features include a Master roll to maintain the life of a Crusher



roll, which in turn crush-forms the grinding wheel with a wide variety of multi-thread patterns which are then transferred to the work. All operations except work loading are automatic.

The multi-rib principle of crushing the thread pattern onto the grinding wheel . . . threading maximum 2″ in length in one and one sixth revolution of the work . . . produces accurate, properly mated threads, closer limits, and size duplication . . . at the highest speeds.

When the Crusher roll pattern has become worn by repeated crushing of the wheel, the Master roll re-crushes the wheel so that the pattern may again be ground onto the Crusher roll . . . easily and fast. Production is maintained . . . no need to send Crusher roll away for regrinding.

A crush-dressed multi-ribbed grinding wheel produces the complete length of thread within the capacity of the machine in the time required to produce *one* thread with a single point grinding wheel. The multi-ribbed wheel also produces many more pieces per dressing and results in uniform threads, correct in lead, angle and diameter.

One great advantage of this machine is that it permits the threading and forming of heat-treated material that is too hard to be thread-milled.

New Bulletin on request. Use address at right.

6HW48 *(Advertisement)*

Who says:

"A TAP IS A TAP ?"

We can't go along with that statement. It's like saying, "A book is a book" . . . (or, closer to home) "A machinist is a machinist."

If you believe that all engineers, machinists, machines, steels, coolants, inspectors, etc. are alike . . . then you might say, "A tap is a tap." But at Hanson-Whitney we know better. So do the thousands of buyers of H-W Taps . . . many of whom have been repeating customers since we pioneered the "finished" tap . . . threads ground after hardening.

H-W Taps are the result of the closest control over materials, men, and machines . . . control that has been evolved through many years of leadership in supplying the right tap for the specific job.

So . . . let's not say, "A tap is a tap" . . . let's say an H-W Tap is a tap of the highest quality, measured, of course, by the number of holes tapped per grind.

HANSON-WHITNEY MACHINE CO. HARTFORD 2, CONN.
Division of Whitney-Hanson Industries, Inc.

For practical recommendations submit your problems to Hanson-Whitney engineers.

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PIONEERS OF FINISHED TAPS

You're OK with P-K *for...*

A new standard of quality and *uniformity* has been pioneered by P-K in the quantity production of Cold-forged *Ground Thread* Socket Set Screws. Ground on hardened blanks, threads are mirror-smooth, assure a dependable Class 3 Fit. Consistently uniform and free from nicks, burrs and hardening scale, they have none of the imperfections common to cut threads.

Compare! *Ask for Samples.* See why P-K Ground Thread Socket Set Screws are different from ordinary set screws as night and day . . . why they will speed assemblies, improve strength and safety. You'll agree your products will benefit — assembly - wise and sales - wise! Parker-Kalon Corp., 200 Varick St., New York 14, N. Y.

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GOOD JUDGMENT CALLS FOR

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WHEN GOOD DESIGN CALLS FOR

SOCKET SCREWS

SOLD ONLY BY ACCREDITED DISTRIBUTORS

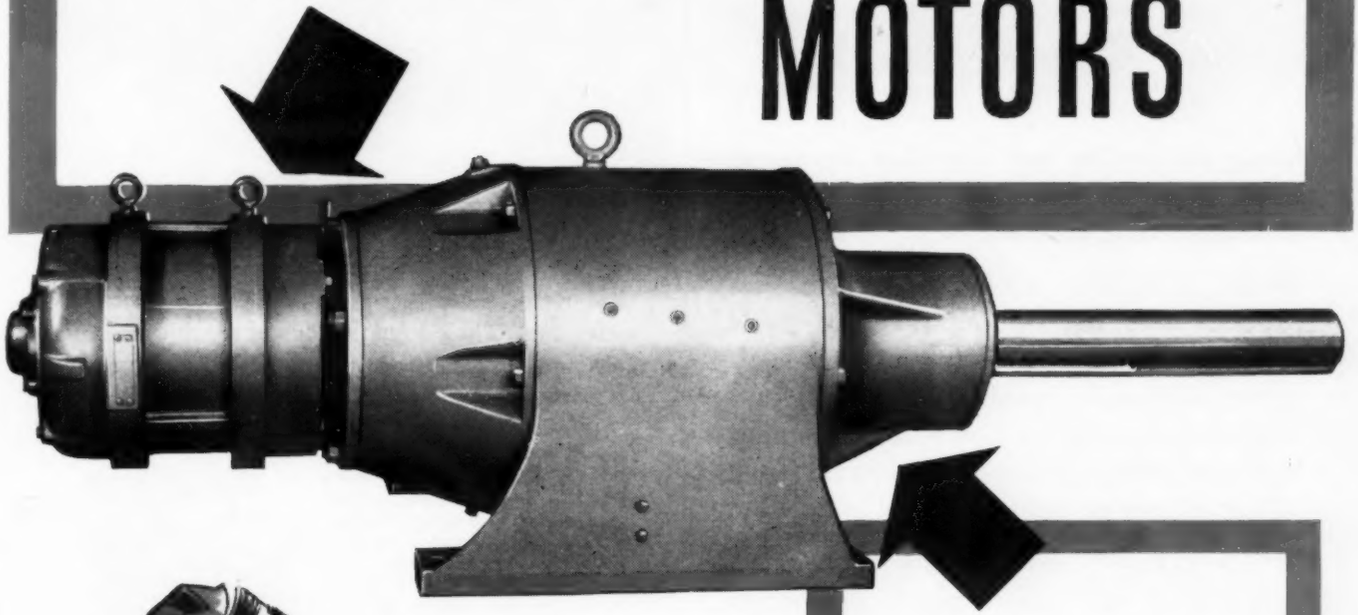
SIZE-MARKED • GEAR GRIP* SOCKET HEAD CAP SCREWS

Another P-K First

Gives you size and thread pitch at a glance — eliminates guessing or "miking" — saves time and errors. Gear Grip prevents slips and fumbles.

*U. S. Pat. No. 126,409

HOWELL *industrial type* MOTORS



Here's a reliable gear-motor combination you'll want to look into.

D. O. JAMES GEAR REDUCER

Why?

Because the motor is an industrial type motor built by Howell and backed by 33 years' experience in building industrial type motors exclusively.

The gear reducer is built by the D. O. James Manufacturing Company, specialists in their field with more than 50 years' experience.

The combination makes an integral packaged unit with the motor flange-mounted to the reducer, yet with a flexible coupling so that motor and reducer can readily be separated for maintenance.

For a modern, economical means of obtaining relatively low speeds from constant speed motors in your business, be sure—buy Howell!

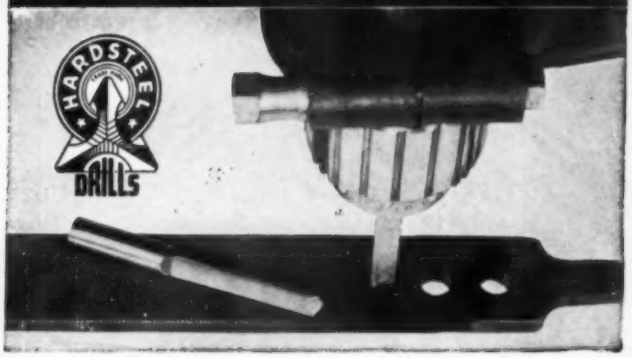
RED BAND MOTORS
HOWELL
SINCE 1915

For geared motors, motors with unique electrical characteristics, special mechanical form, or standard motors (with any type of enclosure) from 1/6 through 150 HP, consult your HOWELL representative.

HOWELL ELECTRIC MOTORS CO., HOWELL, MICHIGAN

MANUFACTURERS OF PRECISION BUILT, INDUSTRIAL TYPE MOTORS

Drill Hardened Steels *without Annealing* with "HARDSTEEL"



Don't let anyone tell you that hardened steels must be annealed before drilling, countersinking, counterboring or reaming.

With "HARDSTEEL" drills you can produce accurate, smooth holes in steels hardened by any process — oil-hardened, water hardened, cyanided, nitrided, and they work equally well on work-hardening steels, and high carbon-high chrome steels of any degree of hardness.

"HARDSTEEL" drills used with standard drill presses cut costs in production shops because parts drilled after hardening always match at assembly. In service shops they save time and material and permit engineering changes calling for additional drilling to be made after parts are full hardened.

Write for a copy of the "HARDSTEEL" Operators Manual showing how "HARDSTEEL" drills are now functioning in thousands of plants in parts recovery operations.

You Harden It — We'll Drill It — with "HARDSTEEL"

"HARDSTEEL" Tool bits make faster, deeper cuts on steels and non-ferrous alloys.

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"HARDSTEEL"
DRILLS • TOOL BITS • SPECIALS

PUMPS
You can install ...and then rely on!

Because of their sturdy, simple construction and precise manufacture, Brown & Sharpe Pumps deliver smooth, economical performance year after year—with minimum attention. Their long periods of trouble-free service have led many of the country's leading manufacturers to standardize on Brown & Sharpe Pumps.

Nos. 1 S, 2 S and 3 S ROTARY GEARED PUMPS WITH HELICAL GEARS . . . Quiet, smooth performance at high speeds for supplying coolant and lubricant . . . for general circulating purposes . . . and for low pressure hydraulic service. Renewable iron bearings. Mechanical seal prevents leakage and eliminates gland adjustments. Furnished with or without integral relief valves.

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Write for catalog of complete pump line with detailed specifications. Brown & Sharpe Mfg. Co., Providence 1, R. I., U. S. A.

B·S

GEARED • VANE • CENTRIFUGAL • MOTOR DRIVEN

BROWN & SHARPE PUMPS

The Birth of Precision

12 HAIRBREADTHS=1 POPPY SEED
4 POPPY SEEDS=1 BARLEY CORN
3 BARLEY CORNS, END TO END=1 INCH
(First used in England, early 16th Century)

Out of a single poppy seed, a 16th Century device first used in England to measure 12 hairbreadths, came man's quest for accuracy of measurement. It was the birth of precision.

Down through the centuries, man has learned the importance and economic value of accuracy. It is imperative in industry and in the fabrication of all materials.

In highway construction, oil fields, on the farm, in the building trades, in the shops of industry . . . at sea, on the rails and in the air . . . in forests, mines and mills, in homes and stores, in class rooms . . . measuring instruments are essential, indispensable to good workmanship and fine quality.

The tape, the rule, the precision tool are instruments of accuracy. Their dependability is governed by the inviolate standards of the men who make them. Lufkin's unending search for ever-finer quality is reflected in products of longer life, greater accuracy and exclusive features which aid today's skilled craftsmen in their all-important work.

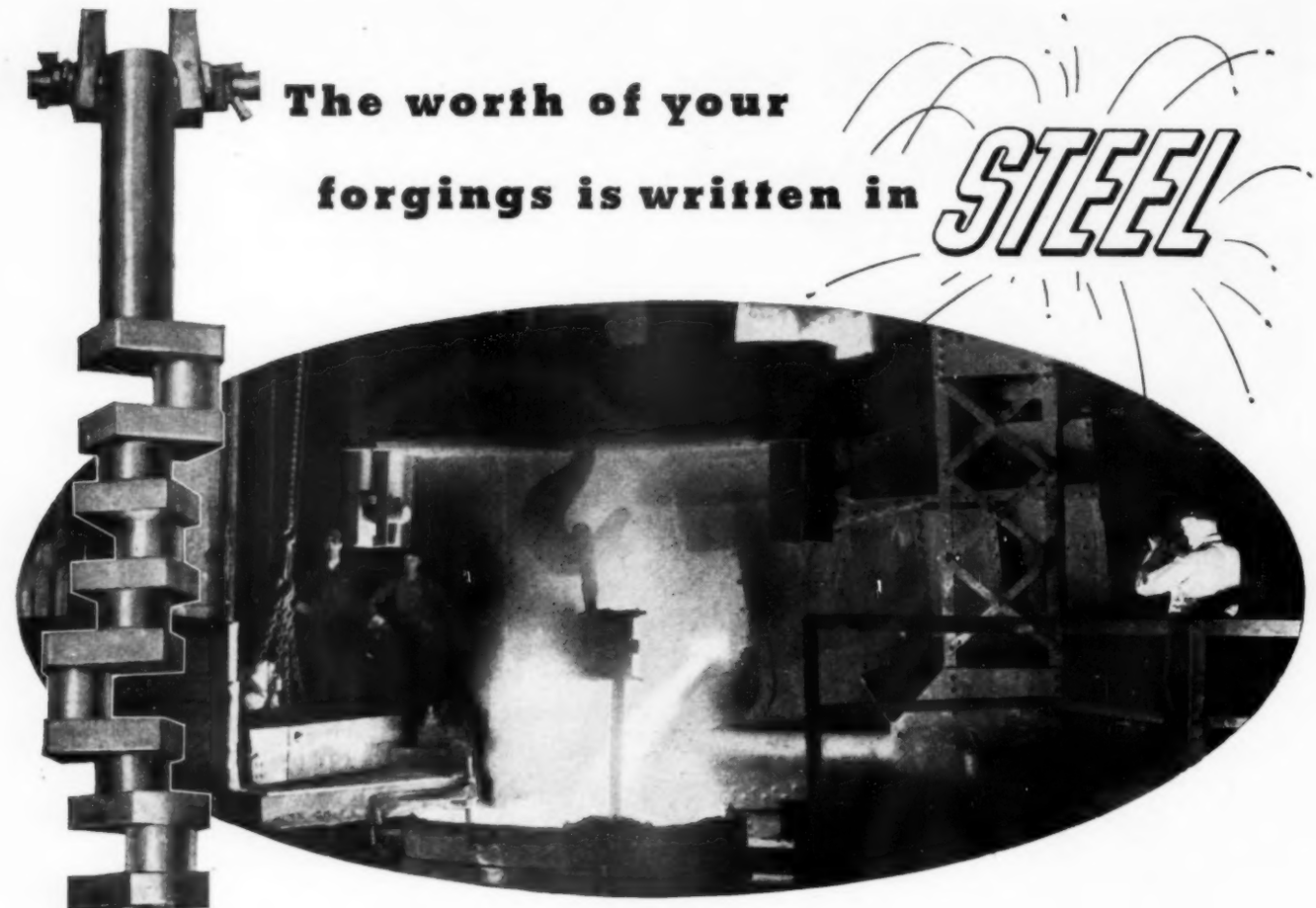
For 65 years Lufkin has dedicated its resources and facilities to the production of better measuring instruments. Wherever precision is a creed . . . wherever man seeks the truth in dimensions the name of Lufkin is recognized as a symbol of undeniable accuracy—a tribute to precision.

PRECISION TOOLS **LUFKIN** TAPES • RULES

Accuracy of Measurement is the Key to Precision

THE LUFKIN RULE COMPANY • SAGINAW, MICHIGAN

The worth of your forgings is written in STEEL

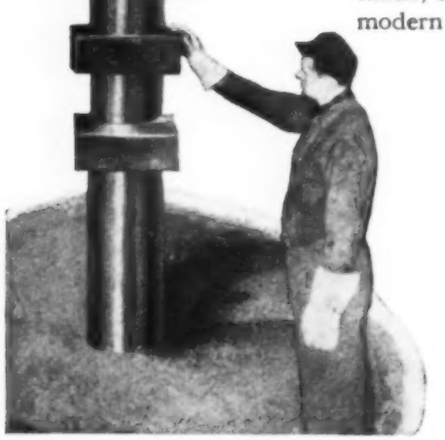


THAT'S WHY—to be sure that the steel *is* right—you find the steel for each forging at National Forge individually melted in basic electric furnaces . . . for basic electric steel is the first "must" in making forgings of optimum quality.

From thirty-five years of steel forging experience, we at National Forge know there is no steel like basic electric for forging purposes. Made from the best raw materials, melted and refined by skilled men, controlled metallurgically from start to finish, all the art and science of modern steel making contribute to the high quality of National Forge basic electric forging steel.

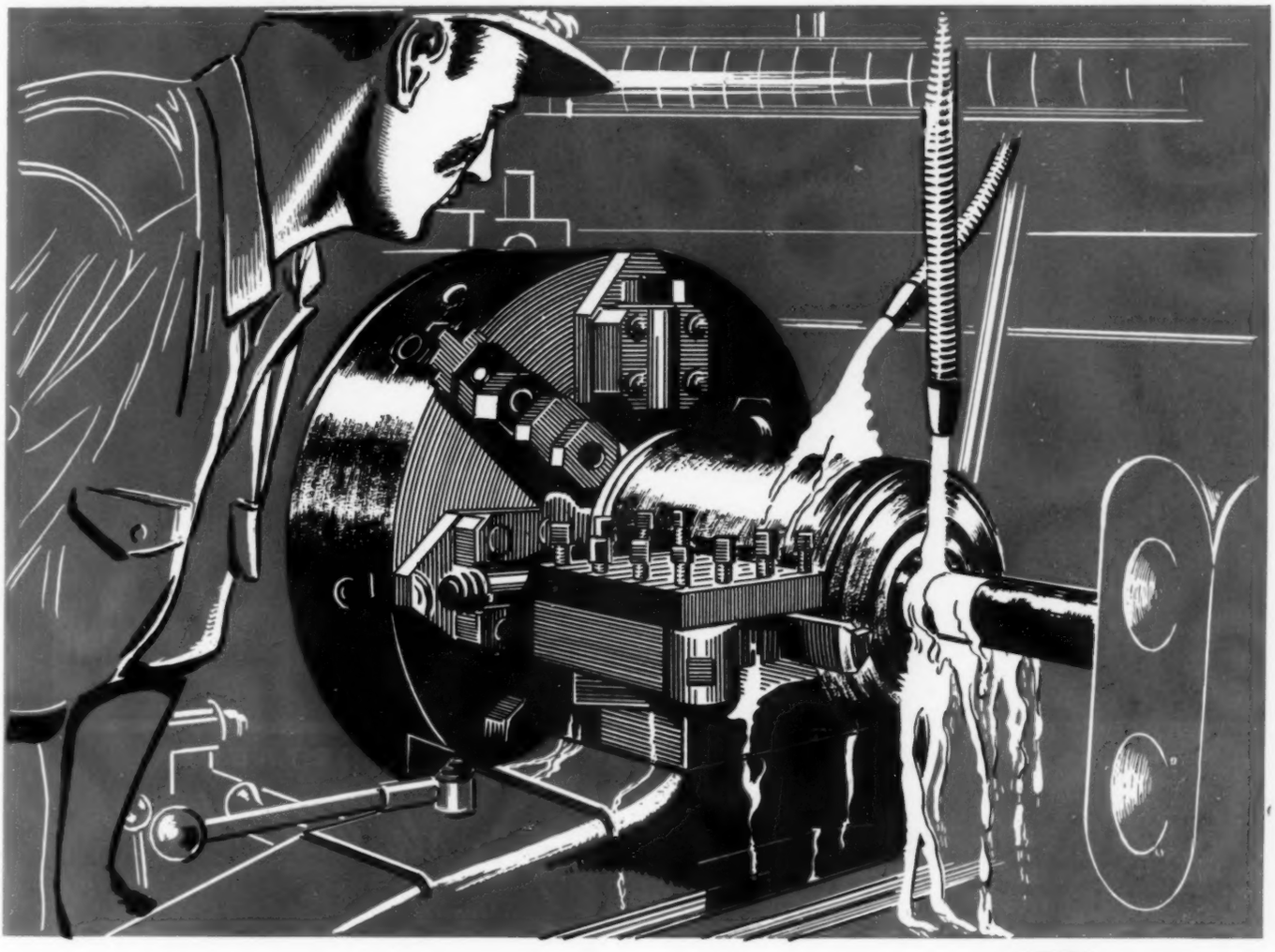
So be steel minded when you order your forgings—and also remember that the forgesmithing, heat-treating and finish machining will be in exceedingly competent, well equipped hands when your steel forgings are National Forged.

Let us tell you the many critical reasons for insisting on basic electric steel, for it will pay you to know these facts as National Forge can give them to you from long-time steel forging experience.



National Forge
AND ORDNANCE COMPANY
Irvine, Warren County, Pennsylvania
STEEL MAKERS • FORGESMITHS
HEAT TREATERS • MACHINISTS

YES! Tycol Amulkut Cutting Oils perform better . . . BETTER . . . BETTER



Tycol Amulkut Cutting Oils perform better because:

. . . *Tycol Amulkut Cutting Oils* are completely soluble oils, scientifically blended for use in a multitude of cutting operations where fluid in emulsified form is indicated.

. . . *Tycol Amulkut Cutting Oils* allow easier, speedier cutting, thereby increasing production. They always mean smoother machined finishes.

. . . *Tycol Amulkut Cutting Oils* spell economy for you . . . they assure longer tool life, reduce spoilage and eliminate possibility of rust.

For complete information about Tycol Amulkut Cutting Oils and the other lubricants that make up the complete Tycol line, contact your nearest Tide Water Associated Office today.

TYCOL
INDUSTRIAL LUBRICANTS

Boston • Charlotte, N. C.
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TIDE WATER ASSOCIATED OIL COMPANY
17 BATTERY PLACE - NEW YORK 4, N. Y.

LUBRICATION — "ENGINEERED TO FIT THE JOB"

KESTER CORED SOLDER

1st in Your Industry

For Peak Soldering Efficiency

IT'S KESTER

Today, high labor costs are a major problem. Increase the efficiency of your production and maintenance by using Kester Cored Solders. Their dependability and uniformity will speed up all soldering operations.

There is a Kester "Specialized" Flux-Core Solder in strand size, type of flux, and alloy to fit your needs. Consult our Technical Service Department.

STANDARD FOR INDUSTRY SINCE 1899

KESTER SOLDER

KESTER
SOLDER COMPANY
4223 Wrightwood Ave., Chicago 39, Ill.
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ELECTROPUNCH
...the little punch with 1,000 uses

If you're looking for a versatile little punch to step up your production and reduce your costs, *ELECTROPUNCH* is the ideal tool.

Today, for example, manufacturers of electrical and other equipment are using *ELECTROPUNCH* to cut costs on hundreds of staking, riveting and wire cutting jobs—jobs which formerly required larger, more expensive machines.

A maximum blow of 2,250 lbs. is delivered at the touch of a button. When variable transformer is used, continuous range of impact from a few ounces up to maximum is possible.

OUTSTANDING FEATURES

- Weighs only 45 lbs.—easily moved about.
- Compact—requires less than 1 square foot of bench space.
- Semi-automatic operation reduces fatigue and rejects.
- Minimum parts to get out of order.

Write today for complete information and specifications.

Shown is bench model BH with 2,250 lbs. impact. Also available is Model B with 1,500 lbs. impact.

Height overall 22½"
Base 9" x 9¾".

BLACK & WEBSTER, INC.
126 MASSACHUSETTS AVE., BOSTON 15, MASS.
DEPT. L

DoALL PORTABLE *Flash Welder*
(DBW-5)

FOR . . .
Bandsaw blades up to 2" wide and drill rod up to 5/16" in diameter and similar work.

DOES . . .
Automatic flash welding; annealing; grinding off flash.

ENABLES . . .
anyone to make uniformly strong welded joints. This dependable heavy-duty flash welder has many advantages—jaws cannot touch each other causing transformer burnout; can be adjusted to match saw blades exactly. There are selective annealing heats for various widths and thicknesses. The weld selector and spring-tension controls are calibrated to synchronize gap spacing and pressure, assuring perfect grain structure, density and uniformity of welds. Capacity 8 KVA. Operates on 220-v. single-phase, 50-60 cycle a.c.

Write for Complete Details

The DoALL COMPANY
Band Saws • Machine Tools • Gage Blocks
Des Plaines, Illinois

CONTOURS - *Simple* OR *Intricate*

are Broached faster . . . for less

Increased production and uniformity of shape and tolerance are two of the most important advantages of contour broaching. Another is the surface finish of the part after broaching . . . usually suitable for final assembly.

In addition, there are great savings in tooling costs and maintenance. All but the simplest forms are broached progressively by a series of broach inserts, each of which produces a part of the contour. This progressive-type tooling eliminates the expense of costly tools having the complete form. Further, because each insert has but the simplest form, usually round or flat, the cost of tool sharpening is greatly reduced. In the event that one insert is damaged, only that section need be replaced. Idle machine time is cut, too, because simple design increases tool life.

Shown above are but a few broached contours of the hundreds for which Detroit Broach has designed and built the tooling. We will gladly outline the advantages of broaching the contours of your parts . . . and give you cost and production data for each. Call your local Detroit Broach representative or write today.

DETROIT *Broach* COMPANY

20201 SHERWOOD AVENUE
DETROIT 12, MICHIGAN

For Highest Shock Absorbing Capacity

and Greatest Load Carrying Ability Use

NORMA-HOFFMANN
ROLLER BEARINGS...

- Performance records in all types of equipment prove that Norma-Hoffmann Precision Roller Bearings have the built-in stamina to stand up under the severest of operating conditions.
- Their short, accurate roller and cylindrical race construction provides maximum load contact area . . . gives these bearings high steady load capacity, large overload capacity, and high resistance to shock and vibration.
- Also available in double and single lipped outer ring types. All are interchangeable with standard single row ball bearings.
- Whether your bearing requirements are for original equipment or replacement, these precision-built Norma-Hoffmann Roller Bearings will give you outstanding performance under the most critical severe conditions of speed, load, shock, and vibration.
- Write for information and engineering assistance.

NORMA-HOFFMANN
***Precision* BEARINGS**
BALL • ROLLER • THRUST

NORMA-HOFFMANN BEARINGS CORPORATION,
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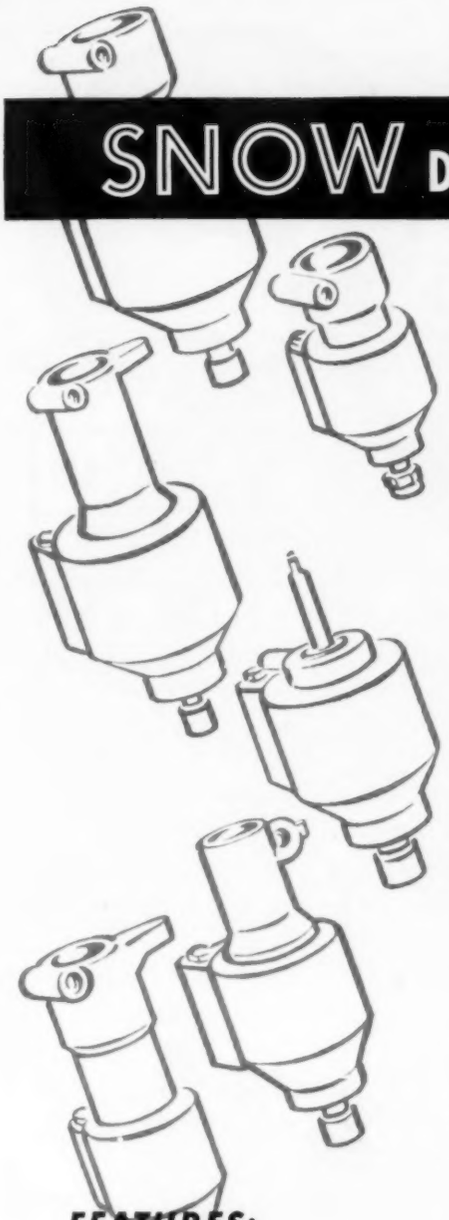
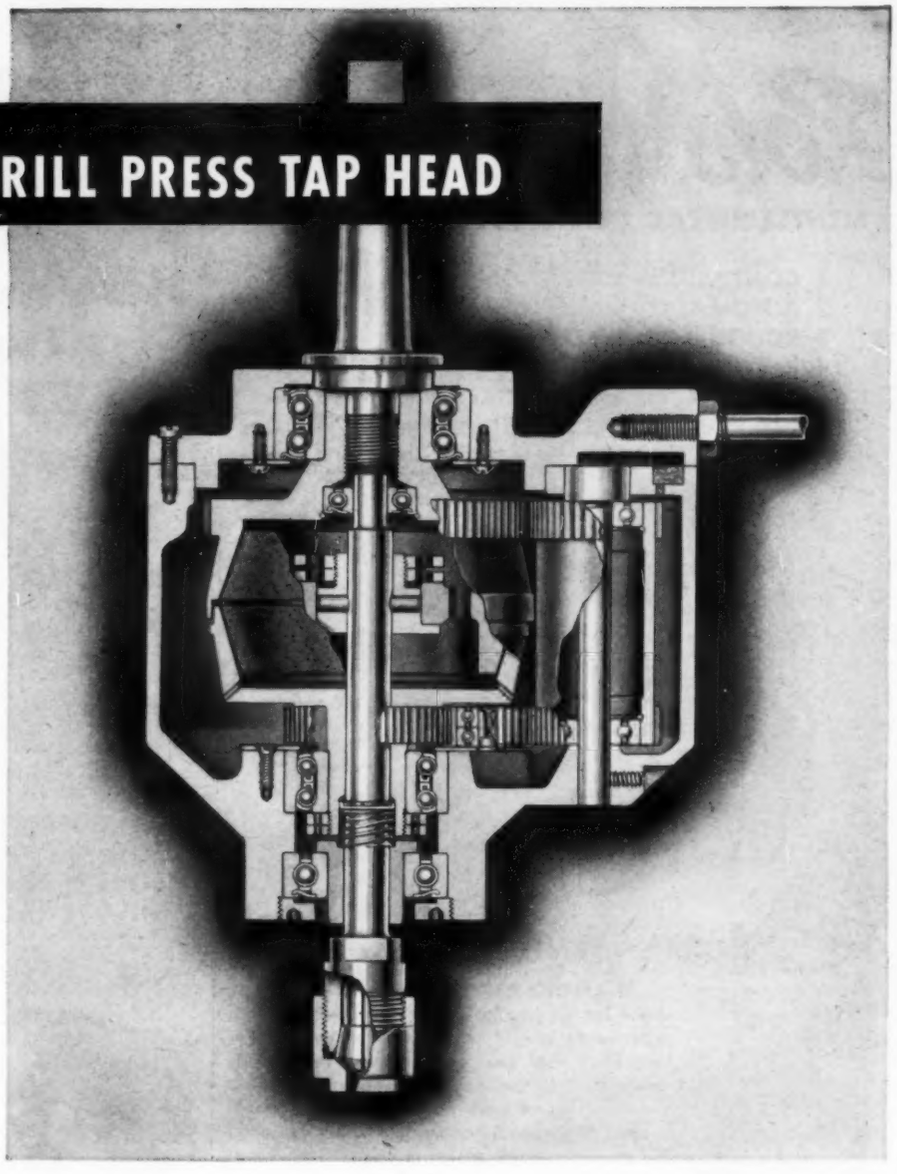
FIELD OFFICES: New York, Chicago, Cleveland, Detroit, Dallas, Pittsburgh, Cincinnati, Los Angeles, San Francisco, Seattle, Phoenix.

SNOW DRILL PRESS TAP HEAD





FEATURES:

- *Drive shells hardened and ground.*
- *Spindle in balance.*
- *Light weight clutch*
- *Spindle bushing revolves with bearing.*
- *No lateral float.*
- *Collets ground throughout.*
- *Eight ball bearings.*
- *2:1 reverse speed.*
- *Hardened alloy gears and studs.*
- *Delivery from stock.*

The SNOW Drill Press Tap Head is the same unit as used on the SNOW Full Universal Tapping Machines. It is the only Tap Head designed and manufactured for a machine tool by a machine tool builder.

Engineers and mechanics will recognize the rigid, sturdy construction; and operators will vouch for length of service, ease of operation, and quality of work produced.

Eighteen years of production testing, and thousands of installations have proven the advantages of using a precision built drill press tap head.

These units are avilable in three sizes—0 through ¼"; No. 6 through ⅜"; and No. 10 through ½"—both Morse taper and quill clamp styles are in stock.

SNOW MANUFACTURING COMPANY

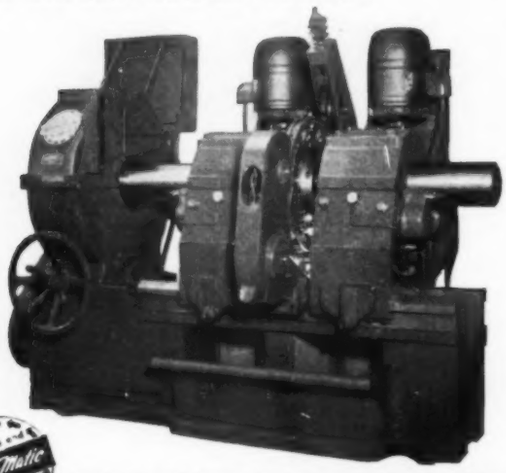
437 EASTERN AVE., BELLWOOD, ILL. • SUBURB OF CHICAGO

Roto 1-A Matic

HORIZONTAL PRODUCTION MILLERS

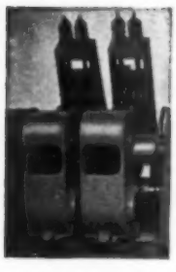
FEATURING

1 CONTINUOUS OPERATION
2 AUTOMATIC CHAIN CLAMPING
3 ROUGH & FINISH CUTTERS — EACH HEAD
4 3 TYPES — VARYING BED LENGTHS
5 LOW MAINTENANCE COST
6 INTERCHANGEABLE FIXTURES

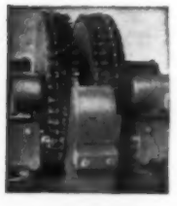


INDEPENDENTLY DRIVEN HEADS

No. 1-A ROTO-MATIC Millers have been produced for the past 30 years in various sizes and types to do specific jobs faster and better than they have ever been done before. Because of their flexibility they have been designed to take a wide range of work with uniform satisfactory results. Engineering has made possible the milling of several work pieces at one time giving a high production of each. In all cases exacting requirements as to quality of work have been met.



Chain Clamping Fixture for rough and finish milling both ends of Control Arm Trunions to length. Interchangeable buttons make possible the milling of several sizes — Production 296 gross per hour.



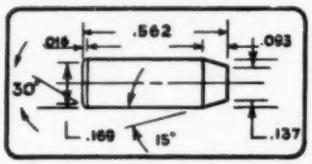
Double Chain Clamping Fixture with a total of 28 stations for milling ends of Clutch Gears — Production 200 gross per hour — With this arrangement two different parts can be milled simultaneously.

Double Drum — 50 automatic holding fixtures on each drum for rough and finish milling radius on Rocker Arms — Production 1400 gross per hour.

ASK FOR BULLETIN 121

DAVIS and THOMPSON CO.
MANUFACTURERS OF *Machine Tools*
MILWAUKEE 14, WISCONSIN

do you need small pieces like this?



BURRLESS
SCREW MACHINE JOBBING WORK

We have demonstrated an exceptional ability to produce, at low cost, unusually small pieces with close tolerances and fine finish and *without burrs* — largely due to the special features of our own POLYMATIC Screw Machines. In addition, we provide the usual facilities of a jobbing shop concentrating on screw machine work.

UNIT MACHINERY COMPANY
650 S. WYMAN ST., ROCKFORD, ILLINOIS

"ROCKWELL" *Superficial* HARDNESS TESTER

—for **ALL-PURPOSE** *and for*

SPECIAL Hardness Testing

Where surfaces are smooth and materials homogeneous, tests made by the "ROCKWELL" Superficial Hardness Tester are as representative of the hardness as those made on the regular "ROCKWELL"—even though the depth of indentation is only .005″ or less. This extremely shallow indentation makes possible the testing of very thin material, nitrided or lightly carburized steel or areas too small for a regular "ROCKWELL" test. This wide range of use accounts for the trend to the "ROCKWELL" Superficial Hardness Tester—*made only by Wilson.*

WILSON
MECHANICAL INSTRUMENT CO., INC.
AN ASSOCIATE COMPANY OF AMERICAN CHAIN & CABLE COMPANY, INC.
230-B PARK AVENUE, NEW YORK 17, N. Y.

ACCO
A C C
TRADE MARK

One size of blade only for both types of E-Con-O-Mills of all diameters. Available for steel, for cast iron, and for non-ferrous materials.

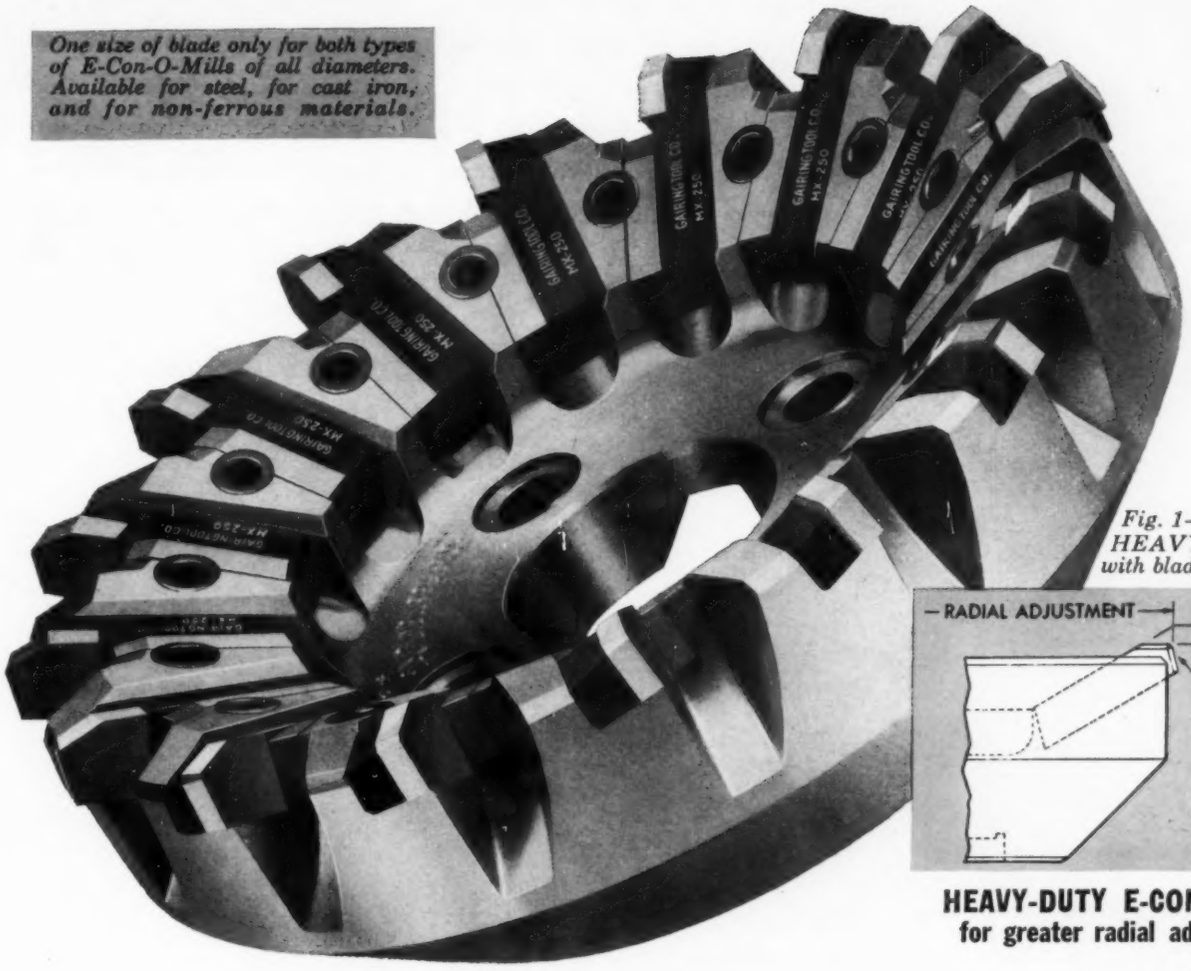
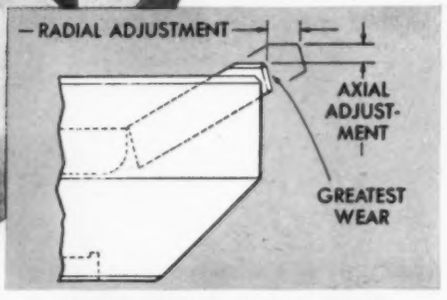


Fig. 1—10-inch HEAVY-DUTY with blades for cast iron



HEAVY-DUTY E-CON-O-MILL
for greater radial adjustment

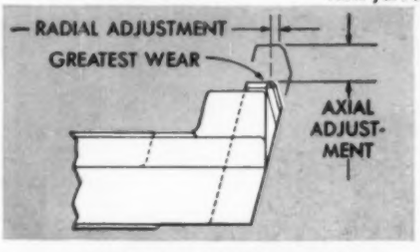
Now . . . the Gairing **HEAVY-DUTY**

E-CON-O-MILL

IN SIZES 8-IN. DIA AND OVER

PATENT APPLIED FOR

Fig. 2 6-inch REGULAR, blades for non-ferrous



REGULAR E-CON-O-MILL
for greater axial adjustment

This new standard face mill is offered for heavy roughing operations where the blades suffer more wear along the periphery than across the face of the cutter. It offers all the economies of the regular E-Con-O-Mill plus longer blade life while roughing.

The same blades and locks are used in both the heavy-duty and the regular cone-type bodies of all sizes, a further reduction in tool inventory.

These are the same blades that come finish ground, ready for work, and which may be replaced and re-sharpened without removing the cutter from the spindle; the same locks which remain entirely attached to the body when changing blades.

For a heavy-duty face mill at its best, call your Gairing representative or write to us.

THE GAIRING TOOL COMPANY

21226 HOOVER ROAD, DETROIT, MICHIGAN

TWIN TOOL STEELS

Midvale Diamond Brand and Diamond-A high carbon, high chrome tool steels meet customers' requirements for tools with high hardness, resistance to abrasion and minimum deformation. They differ in this respect: air hardening Diamond-A is somewhat more machineable and slightly less resistant to abrasion than oil hardening Diamond Brand. Both can be forged, as well as machined. They have a wide variety of application, including dies, rolls, punches, gauges, saws, paper mill knives, hobs, etc. Either can be depended upon to the limit.

THE MIDVALE COMPANY • NICETOWN • PHILADELPHIA

OFFICES: NEW YORK • CHICAGO • PITTSBURGH
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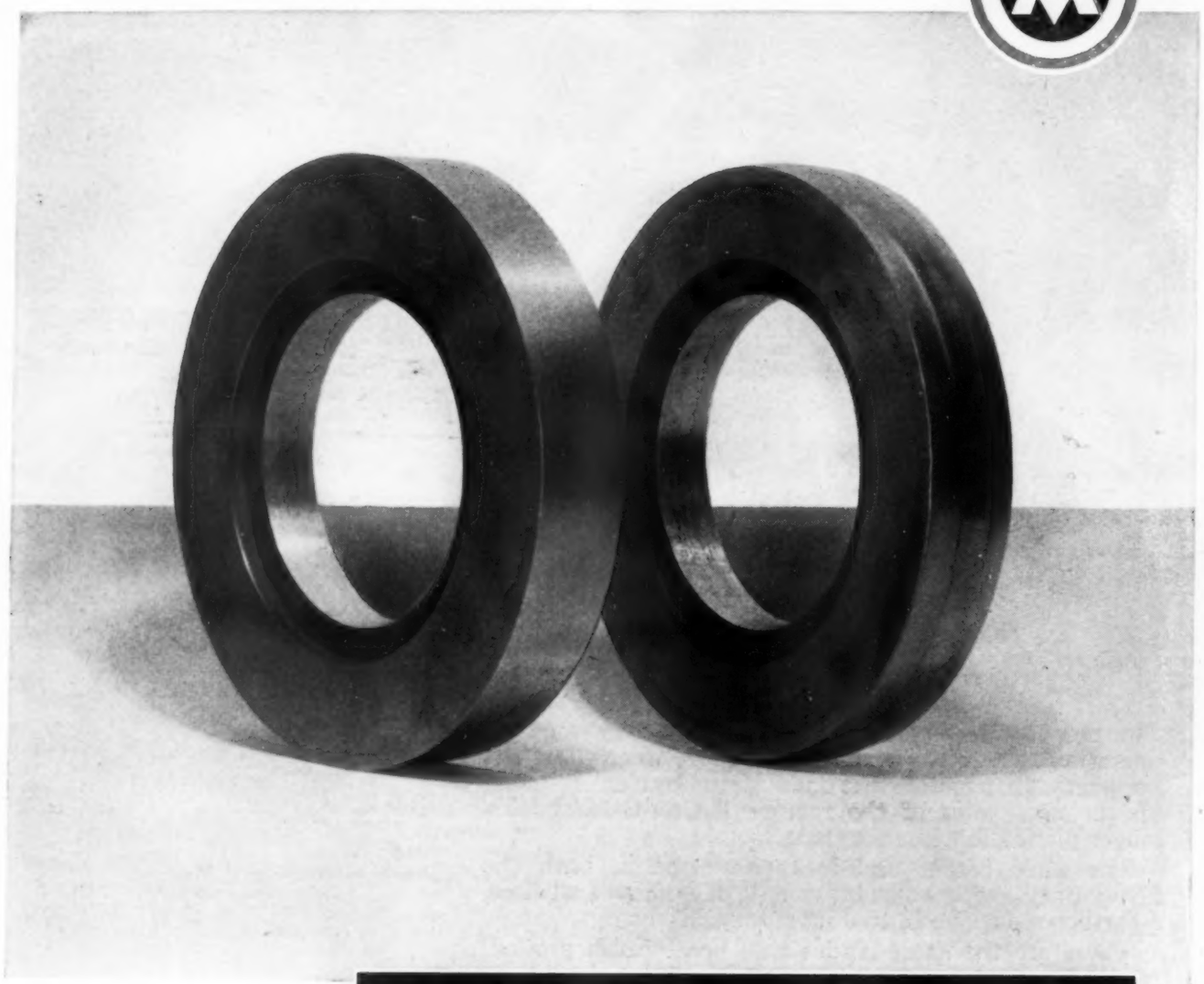


STAINLESS AND TOOL STEEL BARS
•
CORROSION AND HEAT RESISTING CASTINGS
•
FORGINGS AND RINGS

MIDVALE
Custom Steel Makers to Industry

IS SPEED YOUR NEED?

LOWEST cost per hole can be obtained with Standard Red Shield High Speed Drills.

This fact is demonstrated daily by the Aviation, Automotive, Railway, Farm Implement, Electrical and Home Appliance Industries, where these drills are regularly specified and used. Merit alone is the basis for selection and use of Red Shield Drills with these high speed producers.

If fast, uninterrupted production will help your cost picture, investigate the merit of Standard Red Shield High Speed Drills.

Made and stocked in all sizes and designs regularly used by industry.

Distributed coast to coast by leading Mill Supply Distributors.

Our 66 years' experience in solving tough drilling problems is at your disposal without obligation. Write

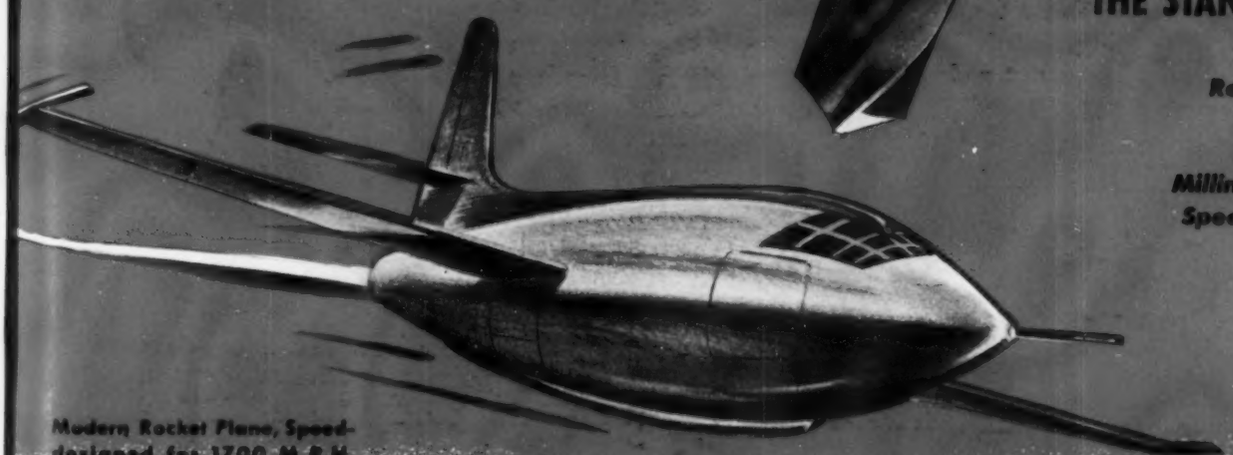
THE STANDARD TOOL CO.
CLEVELAND

Warehouses: New York • Detroit • Chicago

STANDARD TOOL CO.

THE STANDARD LINE

Drills
Reamers
Taps
Dies
Milling Cutters
Special Tools



Modern Rocket Plane, Speed-designed for 1700 M.P.H.

For higher holeage— faster cuts—

Standardize

WE produce and mark with our registered "Shield Brand" trade mark, the following classes of metal cutting tools: Drills—Reamers—Taps—Dies—Milling Cutters—Special Tools.

Our company has produced these high quality tools continuously since 1881. They are made in one plant—under the direction of a highly skilled management, by trained and skilled tool makers. Every modern laboratory control is used to insure uniform quality.

We suggest that you can save money by Standardizing on these Shield Brand Tools for your shop. You will save time and money in numerous small ways. For example, in requisitioning—in purchasing—in stock keeping. You will further get the benefits of uninterrupted high speed production of which these tools are capable. Many find that shrinking profit margins make it desirable to explore every opportunity that promises to save time and money.

The opportunity to Standardize on Shield Brand metal cutting tools is just that kind of a promise.

These tools are sold coast to coast by leading Mill Supply Distributors. Specify by brand name. Inquiries welcome—and given prompt attention.

STANDARD TOOL CO.

THE STANDARD TOOL CO.

CLEVELAND

Warehouses: New York • Detroit • Chicago

New and Improved VICKERS PRODUCTS

For Better Hydraulic Machinery

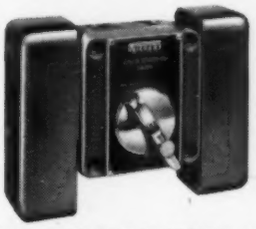
The Vickers units illustrated below are either new products or have recently been improved. Among their advantages are small size, and many have gasket mounting for even more compact hydraulic installations. For information regarding any of these new or improved units, ask for the Data Sheet or Bulletin number indicated.

VICKERS CHECK VALVE (In-Line Type)

For working pressures up to 3000 psi, this compact check valve can be furnished for piping sizes ¼", ¾" and 1½". Data Sheet 113720.

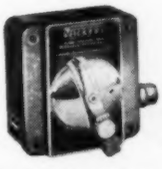
VICKERS FLOW CONTROL VALVE

Accurate control of oil flow in hydraulic systems (independent of pressure variation) can be obtained with this compact, gasket mounted unit. Bulletin 45-35.



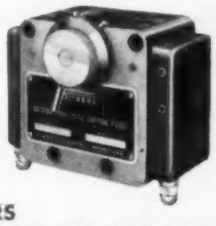
VICKERS CYCLE CONTROL PANEL (Solenoid Operated)

A compact unit for controlling rapid traverse and adjustable feed cycles with fully remote electrical cycle timing. Data Sheet 109164.



VICKERS FLOW CONTROL AND OVERLOAD RELIEF VALVE

Compact metering valve incorporates the Vickers patented flow control and relief valve for regulation of oil flow and pressure. Bulletin 48-36.

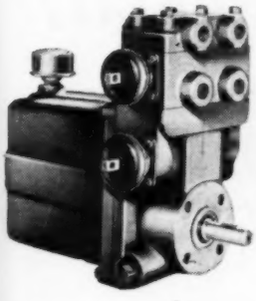


VICKERS RECIPROCATING CYCLE PANEL

For reciprocating cycles of machine tool carriages, etc., with accurate and selective reversal control. Data Sheet 80803.

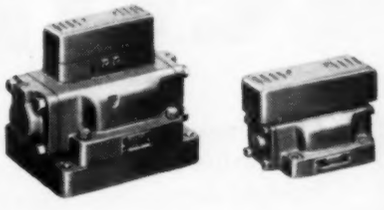
VICKERS PRESSURE SWITCH

Available in two models for pressure ranges 100-2000 and 500-3500 psi with independent pressure differential adjustment. Data Sheet 113929.



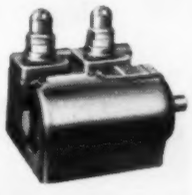
VICKERS POWER PACK

Vane type hydraulic pump, overload relief valve, oil tank, filter and operating valve are included in this low priced unit. Bulletin 46-48a.



VICKERS SOLENOID OPERATED CONTROL VALVES

Compactness, simplified installation and minimum piping are but a few of many features. Bulletin 48-27.

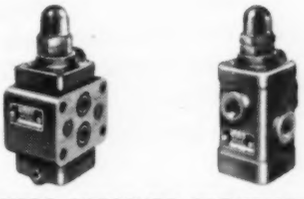


VICKERS TWO PRESSURE PUMP (Small)

Two vane type pumps and integral automatic valving, all combined in this compact unit, providing high-low pressure pumping action. Data Sheet 117994.

VICKERS PRESSURE REDUCING VALVES

Maintain accurate reduced pressure; available with integral free return flow check valve, gasket and screw connections. Data Sheets 101885, 100165.



VICKERS PRESSURE SEQUENCE CONTROL VALVES

These new sequence valves are available for smaller piping sizes, and are arranged either for gasket mounting or threaded-connections. Bulletin 45-34a.

VICKERS PROPORTIONAL OIL FILTER

This compact filter provides continuous micronic filtering for hydraulic systems at pressures up to 3000 psi. Bulletin 47-50.

3671

VICKERS Incorporated

DIVISION OF THE SPERRY CORPORATION

1400 OAKMAN BLVD. • DETROIT 32, MICHIGAN

Application Engineering Offices:

ATLANTA • CHICAGO • CINCINNATI • CLEVELAND
DETROIT • LOS ANGELES • NEWARK • PHILADELPHIA
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Every Chase free-cutting ROD ALLOY is...

HOT and COLD worked!

TO assure you free-cutting rod alloys of unmatched quality they *all* are extruded and then cold drawn to finished dimensions. This hot and cold working is your insurance that the rod you buy from Chase is of uniform composition and structure...rod that is held to extremely close dimensional tolerances.

And from Chase you can buy any type of rod alloy that you especially need for a particular job. We regularly make 19 rod alloys... several of which should be the answer to your requirements. If not, you can draw upon our extensive Research Department facilities...all as part of Chase Service. Don't you think it worth while to call your nearest Chase Warehouse or Service Office today? You'll get *only the best* for *your* needs!

Chase *the Nation's Headquarters for* **BRASS & COPPER**

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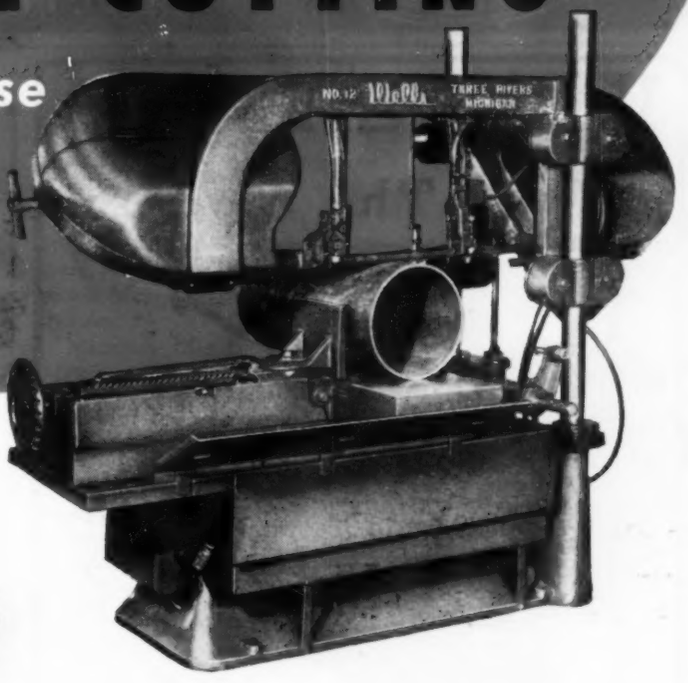
THIS IS THE CHASE NETWORK . . . *handiest way to buy brass*

ALBANY† ATLANTA BALTIMORE BOSTON CHICAGO CINCINNATI CLEVELAND DETROIT HOUSTON† INDIANAPOLIS KANSAS CITY, MO. LOS ANGELES MILWAUKEE MINNEAPOLIS NEWARK NEW ORLEANS NEW YORK PHILADELPHIA PITTSBURGH PROVIDENCE ROCHESTER† SAN FRANCISCO SEATTLE ST. LOUIS WATERBURY (†indicates Sales Office Only)

Now YOU CAN HAVE THE ADVANTAGES OF WET CUTTING

. . . with either of these popular WELLS METAL CUTTING BAND SAWS



• RIGHT — *The heavy duty Wells No. 12 with wet cutting system features an automatic cutting cycle and controlled blade pressure. Capacity is 12" x 16" rectangular; 12¾" rounds; die blocks, 12¾" deep, 16" wide, 18" clearance, bed to blade.*

• ABOVE — *The versatile Wells No. 8 with wet cutting system. Suitable for production or general utility. Capacity is 8" x 16" rectangular (5" x 24" with special guides); 8" rounds.*

BOTH the No. 8 and the new No. 12 Wells Metal Cutting Band Saws are now offered with complete, self-contained Wells wet cutting systems. Experience gained through wide use of this system on the No. 8 saw has proven that it will pay for itself quickly thru production cost reductions. Controlled flow of liquid into cutting area increases blade efficiency and permits safe use of higher f.p.m. cutting speeds. Get full details on this economical extra today and ask about a wet cutting system for your present No. 8 or No. 12 Wells Saw.

Wells SAWS

Wells

Products by Wells are Practical

METAL CUTTING BAND SAWS

WELLS MANUFACTURING CORPORATION
505 ROOSEVELT RD., THREE RIVERS, MICH.

"Anti-friction Bearings Throughout"

CARLTON RADIAL DRILL

FEATURES: 1. Low Hung Drive to Spindle. 2. All Power Driven Parts Running in Oil. 3. Quiet Running at all Speeds. 4. Concentrated and Convenient Push-button Controls. 5. Constructed on Unit Principle.

THE CARLTON MACHINE TOOL COMPANY

CINCINNATI 25, OHIO, U. S. A.

KEYSEATING

The Modern Way

Illustration shows typical set-up for cutting taper keyway with table tilted.

Machines are made in three sizes for keyways 1/16" to 1¼" in width.

Great simplicity and ease of operation of Davis Keyseaters assure the user of accurate, time saving work.

Let our engineer study your keyseating problems.

DAVIS KEYSEATER COMPANY

403 EXCHANGE ST. ROCHESTER 8, N. Y.

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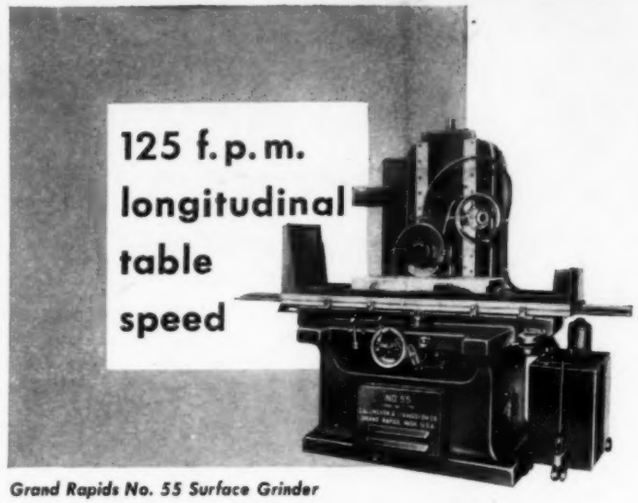
125 f.p.m. longitudinal table speed



Grand Rapids No. 55 Surface Grinder

Faster precision production is possible with the exceptional table speed of Grand Rapids Hydraulic Feed Surface Grinders. Both longitudinal table travel and cross feed are automatic, hydraulic. Wheel head is powered for rapid vertical travel.

Write for Bulletin GL-101

GALLMEYER & LIVINGSTON COMPANY

Manufacturers of Grand Rapids Grinders

330 STRAIGHT ST., S. W., GRAND RAPIDS 4, MICH.

You'll Save Time and Money With

MARSHALLTOWN THROATLESS SHEARS

Cuts Any Shape

Cuts Any Size

CAPACITY UP TO 1/4" STOCK

Here's the shear that offers best performance features. Cutting speed 6' per minute. High grade tool steel cutters. Write today for details. Prompt shipment.

MARSHALLTOWN MANUFACTURING COMPANY

910 E. Nevada St. Marshalltown, Iowa

How Stewart-Warner Corp. Uses the AUTOMATIC 4 STEP WAY to Cut Unloading Costs $6,222.50

Saves 4,750 Man-Hours!

With an investment in only 2 Automatic Skylift Electric Trucks and 3 Transporters, STEWART-WARNER CORPORATION, Chicago, earned a return of over 75% in man-hours saved and handling costs reduced in their home radio division.

In the unloading of hundreds and hundreds of carloads of difficult-to-handle radio cabinets, time studies and cost figures tell a truly amazing story of human energy saved, handling costs slashed almost unbelievably.

Without SKYLIFT, it took 25 man-hours to unload one carload of radio cabinets—a labor cost of $32.75 per car. With Skylift, it took 6 *man-hours* to unload the same car—*a saving of 19 hours, or $24.89 labor cost saved per car!*

Multiply this by the hundreds of carloads on the Stewart-Warner unloading schedule, and you see why the AUTOMATIC 4 STEP WAY shown here can cut handling costs of unloading radio cabinets as much as $6,222.50 in just one phase of their production operation. Similar savings may be yours. Mail coupon.

1 DRIVE IN AND OUT OF BOXCAR WITH LOAD. Skylift moves through a standard 7 foot door. As shown here, operator drives inside car, forks pick up a pallet load of radio cabinets, and he moves out of car on his way to storage. Low collapsed height of 83 inches permits this. And it handles as easy as an automobile, with easy finger-tip lever control for lift and tilt, forward and reverse.

2

NARROW AISLES NO HANDICAP. As shown, Skylift is light weight, compact—moves through narrow aisles, turns sharp corners, moves to storage areas in minimum time, with minimum effort. Compare this with tedious, back-straining effort of moving cabinets manually. Yes, Skylift lightens labor's load, management's, too!

3

CEILING HIGH STACKING. Once in the storage area, a flip of the tilt and lift lever, and the load of radio cabinets is stacked easily and neatly to ceiling heights—as high as 130 inches, providing extra storage space free. When required for the production line, cabinets are brought to floor level just as easily, ready for movement to production.

An ATCO Specialist will make a free survey to determine how much you can cut your product handling costs. Mail coupon.

4 TRANSPORTERS MOVE PRODUCT FROM STORAGE TO PRODUCTION. Automatic's mighty midget of electrical power receives the pallets of radio cabinets and moves them with easy push-button control to the production line. Dual-Lift Foot Pump, or ATCO Electric Lift gets load off floor into moving position, and Transporters again take the finished radios from end of production line to shipping—a 4-way product handling operation utilizing minimum energy, maximum savings!

3rd ★★★★ NATIONAL MATERIALS HANDLING EXPOSITION PHILADELPHIA CONVENTION HALL JAN. 10-14 1949

Skylift
ELECTRIC TRUCKS
A PRODUCT OF AUTOMATIC
Lighten LIFE'S LOADS

AUTOMATIC TRANSPORTATION COMPANY
DIV. OF THE YALE & TOWNE MFG. CO.
59 West 87th Street, Dept. W-8 Chicago 20 Ill.

Please mail me, without cost, complete facts on how I can cut my material handling costs with Automatic Skylift and Transporter Electric Trucks.

☐ Have an ATCO Specialist make a free survey of my material handling methods and costs.

Company Name.....

By..... *Position*.....

Street Address.....

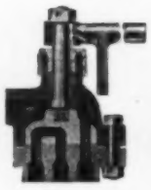
City.....*Zone*.....*State*.....

These 4 Nicholson Units Help You

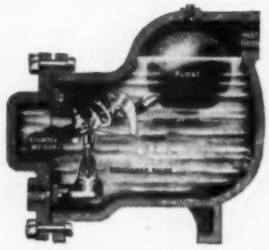
DO IT FASTER

The time saved by these Nicholson units is a matter of record in shops the nation over.

NICHOLSON CYLINDER CONTROL VALVES—Custom construction for specific mediums saves maintenance time. Pressures to 500 lbs. Catalog 546.



NICHOLSON ARBOR PRESSES—Service records show they deliver the necessary punch, smoothly. 5 sizes for work to 20" diam. Bulletin 845.



NICHOLSON AIR TRAPS feature a positive fluid seal, assuring quick and efficient drainage of intercoolers, aftercoolers, separators, tanks, etc. Instantaneous action due to weight operation; hardened stainless steel where it counts. Nicholson Catalog 448 describes drainage methods for all mediums.

NICHOLSON EXPANDING MANDRELS—Set of 14 does work of 209 solid arbors; prove sensational time savers in some operations. Sold singly or in sets; for bores 1/2" to 7". Bulletin 1043.

Send for bulletins or see Sweet's

W. H. NICHOLSON & CO.
114 Oregon St., Wilkes-Barre, Pa.

IT'S AS EASY AS PIE . . .
TO CUT KEYWAYS, BY HAND, IN 1 MINUTE!
Any Standard Width Keyway, Any Depth—In GEARS, CUTTERS, COUPLINGS, COLLARS, PULLEY HUBS, ETC.
with this Minute Man KEYWAY BROACH KIT . . .
Precision-made and handsomely cased by
The du MONT CORP.
GREENFIELD, MASSACHUSETTS

MAIL THIS COUPON

The du Mont Corporation, Greenfield, Mass.

Please mail Descriptive Folder and Price List A together with the name of the Mill Supply Distributor that can show us the complete range of *Minute Man* Kits

Company .....

Address .....

Name and Position .....

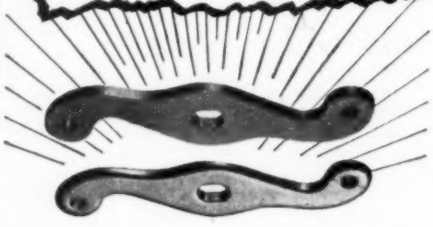
ROTO FINISH
Trademark Reg. U. S. Pat. Office

DOES CUT FINISHING COSTS

FISHING REEL MFR. REPORTS . . . *(NAME ON FILE)*

"The cost of finishing 11,000 crank plates by hand involves 268 hours at $1.18 per hour for a total of $316.00.

"The cost of finishing the same by Roto-Finish involves 138 hours at 30c per hour or a total of $41.00. The net saving is $275.00."



Unretouched illustration shows crank plate for fishing reel; above, before Roto-Finish deburring and finishing; below, after Roto-Finishing.

Such savings are possible in your finishing department, too! See how Roto-Finish produces a semi-lustrous surface uniformly on one or a thousand pieces; how it handles precision work. Send sample die castings, stampings, machined parts, forgings for processing. Include finished part for guide. No obligation! **THE STURGIS PRODUCTS CO., 812 Jacob Street, Sturgis, Michigan.**

FOREIGN LICENSEES:
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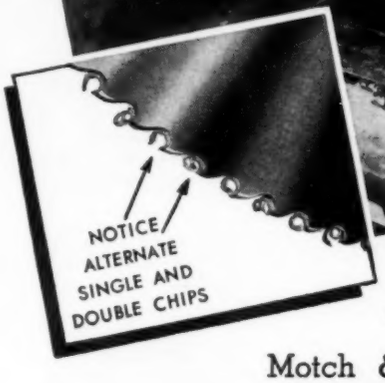
Windsor, Canada
Roto-Finish Limited, London, England
A. Flavell Pty. Ltd., Melbourne, Australia

ROTO-FINISH
THE ENGINEERED
MECHANICAL FINISHING PROCESS

More POWER to your Blades!

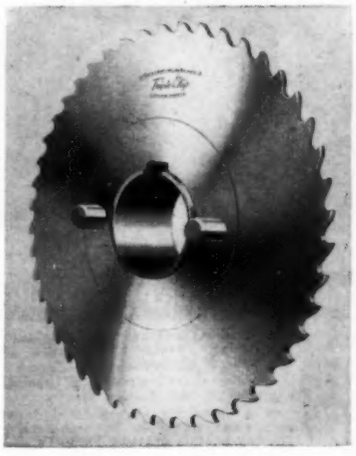
Motch & Merryweather Triple-Chip SLITTING SAWS and DUAL DRIVE ADAPTORS insure more profitable slotting production.

Triple-Chip METHOD



• MORE POWER • HIGHER PRODUCTION • LOWER COSTS • LESS BREAKAGE

Motch & Merryweather Slitting Saws have an exclusive dual drive feature through which balanced power is transmitted, eliminating the stresses which cause breakage. A broad, flat hub affords plenty of surface contact for rigid holding, which balks tooth weaving tendencies. Accurate slotting results. Our exclusive Triple-Chip tooth form breaks up and distributes the cutting load, permitting heavier feeds. Deep gullets increase blade strength and produce curling, self-ejecting chips (no clogging). You need fewer blades, since M. & M.'s exclusive adaptors fit many arbor sizes. Three standard tooth spacings in every diameter and thickness aid the cutting of thick or thin sections.



M. & M.'s exclusive dual drive delivers more power to the blade without danger to the driving means. Ample side clearance is ground into the blade down to the broad hub. Standard dual drive adaptors are designed with ample keyway to more than satisfy tough cutting requirements.

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PENTON BUILDING • CLEVELAND 13, OHIO

CUTTING TOOL DIVISION

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THERE IS AN
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ROTARY SWAGING MACHINE

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- The dies and hammers rotate around the work, which is held stationary, quickly swaging it to desired size and shape.
- Built to handle the severest work with capacities up to 14 inches in diameter.
- Integral forced coolant and lubrication systems.
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- Cast alloy steel drum mounted on base and bolted to front housing.
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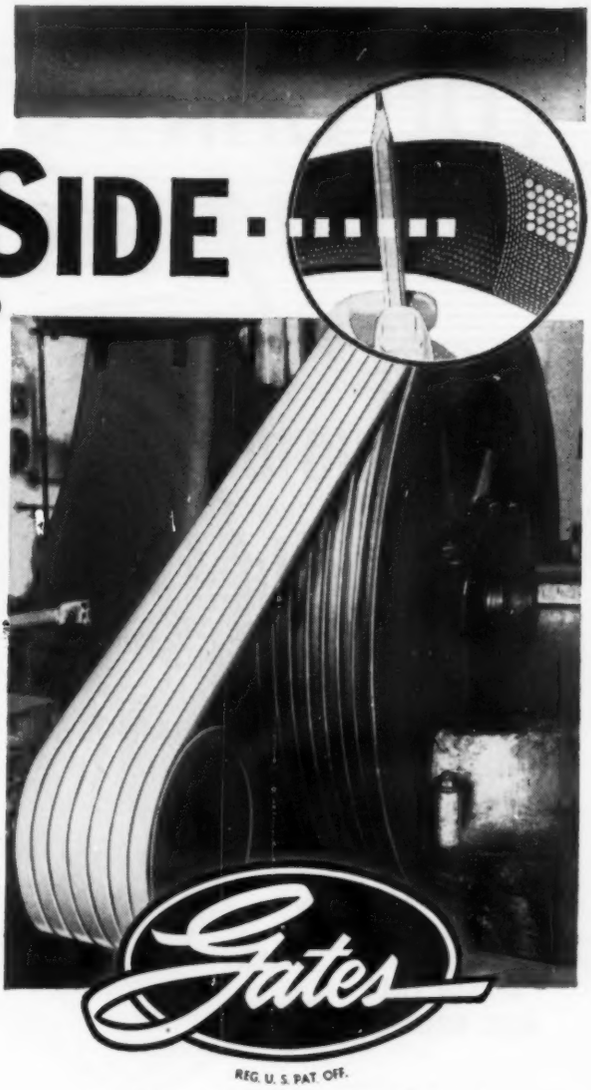
Here is **WHY** *the*

CONCAVE SIDE

(U. S. PATENT NO. 1813698)



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The Mark of SPECIALIZED Research

SAVES You Many DOLLARS In V-BELT Costs!

Every time a V-Belt bends around its pulley, the *top* of the belt is under *tension* and grows *narrower*. The *body* of the belt is *compressed*—causing the *sides* to *bulge out!*

FIG. 1

Because of these stresses, any V-Belt built with straight sides is forced to assume, in the sheave groove, the shape shown in figure 1, on the left.

This forced bulging of a *straight-sided* V-Belt against the sheave groove walls naturally produces excessive wear along the *middle* of the belt's sides—as indicated by the arrows. Also, because the full side of the belt does not *uniformly* grip the pulley, there is a definite loss in drive efficiency.

Now see the difference when you bend the V-Belt that is built with the precisely engineered Concave Side (U. S. Patent No. 1813698)—the Gates Vulco Rope.

FIG. 2

As the Gates Vulco Rope bends, its Concave Side becomes straight (Figure 2). It exactly fits the sheave groove—and this gives you two very definite savings:—

(1) No out-bulge of the sides means uniform side-wall wear—*longer life!*

(2) *Full side-width* grip on the pulley carries heavier loads and sudden load increases without slippage—saving your belts and saving power too!

The Concave Side is MORE IMPORTANT NOW Than Ever Before!

Because the *sides* of a V-Belt are what actually *drive* the pulley, it is clear that any increased load on the belt means a heavier load that must be transmitted to the pulley *directly* through the belt's sidewalls.

Now that Gates SPECIALIZED Research has made available to you *SUPER* Vulco Ropes—carrying fully 40% higher horsepower ratings—the life-prolonging Concave Side naturally delivers greater savings today than ever before.

4810

GATES VULCO ROPE DRIVES

Engineering Offices and Jobber Stocks IN ALL INDUSTRIAL CENTERS of the U. S. and 71 Foreign Countries

THE GATES RUBBER COMPANY
DENVER, U.S.A.
"The World's Largest Makers of V-Belts"

YOU CAN'T GO Wrong

OLIVER OF ADRIAN

— It's AUTOMATIC

OLIVER FACE MILL GRINDERS

Originally developed for the automotive industry, firmly established in the largest of these plants, this fully automatic Face Mill Grinder is now widely used in a variety of plants where face mills are ground in quantity.

Positive reproduction of tooth shape, extremely accurate grind and surface quality are characteristic of this grinder. It is only necessary to clamp the cutter on the face plate—the machine goes through the operations of indexing and grinding each tooth in succession, without further attention. One operator can tend a battery of these grinders, producing better ground mills faster than ever before.

The Oliver Automatic Face Mill Grinder has a standard capacity for mills from 10" to 21" in diameter, can be modified easily for other capacities. (For High Speed and Tungsten-Carbide.)

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IMPROVE YOUR TOOLROOM IT'S THE BACKBONE OF PRODUCTION

OLIVER OF ADRIAN

AUTOMATIC DRILL GRINDERS
TOOL & CUTTER GRINDERS—DRILL POINT THINNERS—TEMPLATE TOOL GRINDERS—FACE MILL GRINDERS—DIEMAKING MACHINES

NEW 4-SPEED *Strandflex* FLEXIBLE SHAFT MACHINES

provide the newest and only outstanding improvement in Flexible Shaft Machinery in 25 years. It's another Strand step forward in quality precision tools for faster, easier and more economical production work. The Strandflex 4-Speed gear drive employs a patented, new type of quick change gear drive utilizing 4 POSITIVE speeds by a unique and easy method of instantly changing from one speed to another. Powered with totally enclosed ball-bearing motors (having speeds from 850 to 9000 R.P.M., depending on motor) means years of smooth, trouble-free service. Send for Bulletin No. 43-A for full details.

Standard 3 speed counter shaft type Strand machines also available for portable rotary power at constant speeds for grinding, buffing, drilling, wire brushing and rotary filing, in all types and models from ⅛ to 3 H.P.—for every specific requirement. Send for Catalog No. 30.

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Universal Gauge

for rigid inspection of a wide range of parts . . .

An almost unlimited use is offered by this instrument for inspecting duplicate parts in quantity or any small parts with flat surfaces or recesses.

Use of standard blocks made possible by raising or lowering table increases capacity to take material up to 2" in height. Graduated to read to .001 inch: height 9¾"; weight 5 lbs. 1¼ oz.; depth from frame to spindle 1⅜".

Full details on request

Can be supplied with sliding head and table: also on a stand with throat 3" deep.

FRANK E. RANDALL CO.
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Makers *Waltham 54, Mass.*

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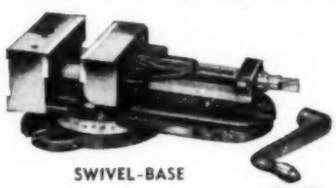
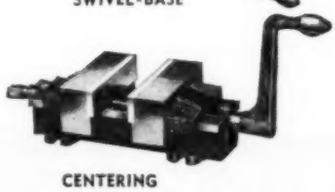
Both have the famous Graham flush, parallel, square jaw construction. Swivel-base type has ADJUSTABLE ZERO POINTER. Can use Jig attachments.

In Centering Vise, both jaws move toward center, giving double-fast action as well as centering work.

Request Brand New Bulletin 44



SWIVEL-BASE



CENTERING

GRAHAM MFG. CO.
84 BRIDGE STREET
EAST GREENWICH, R. I.

One of a series *of messages to help you increase your understanding of business paper advertising, and its effect on your job.*

What's so glamorous about advertising?

THERE IS A curious belief in some quarters that advertising lives in a glamorous and almost occult world of its own, quite insulated against the cold science of the production line.

That, of course, is pure Hollywood.

Advertising today (in the *business* press, at least) is about as glamorous as a drop forge, and twice as efficient. It can become just as important to your profit-and-loss picture as plant maintenance, safety engineering, production techniques or cost-accounting. Maybe even a little more so.

Because the biggest plant capacity, and the best production know-how, can't create a single dollar of profit—*not until something is sold.* And selling, in our economy, is a mass production job!

Advertising simply provides the necessary machinery. It is the application of assembly line methods to the *manufacture of a sale.* For sales don't just "happen." Like any other commodity, they require a series of processing operations. Usually, it takes five:

1. **Seeking out prospects**
2. **Arousing their interest**
3. **Creating a preference for your product**
4. **Making a specific proposal**
5. **Closing the order**

By *mechanizing* the first three of these operations, advertising enables your salesmen to concentrate on the two jobs which they alone can do, and do best. And nowhere does the machinery of advertising work more efficiently than in the business press, where it reaches the greatest number of interested prospects, at the lowest possible cost.

Maybe—to the man who appreciates machinery—advertising is a pretty glamorous business, at that!

American Machinist

is a member of The Associated Business Papers, who have just published a book entitled, "Copy that Clicks—with readers." *Next time you see your advertising manager, ask him to show it to you. And if you'd like a copy of your own, we'll be glad to mail you one.*

BARRETT "FILWHIRL" ENAMELERS make easy work of many difficult coating problems

The Barrett "Filwhirl" is a Centrifugal Enameler providing a clean, sure and economical way of applying finishing materials to parts or products that can be rotated in fair balance in the revolving bowl. It wastes no coating material, and reduces time and expense when compared with other methods of applying a good commercial finish. It is designed for bulk handling, and can be depended upon for speedy production requirements.

It has proven highly successful in the coating of helical springs, clips, clasps, zipper parts, bead and link chain, toys, automobile and luggage hardware, misc. metal stampings, castings, etc. Excellent results are also obtained with japan, lacquers, varnishes, paints, waxes. No drips or fatty edges.

Furnished in spindle post, fixed bowl, and carrier types, in several capacities. Safety features included and auxiliary equipment is available.

Send a few representative samples to be processed and submitted for your examination.

The Barrett Centrifugal Enameler.

THE LEON J. BARRETT COMPANY, 1800 Grafton Road, **WORCESTER, MASS.**

Designers and Builders of Centrifugal Machinery

ERRINGTON MECHANICAL LABORATORY

STAPLETON, STATEN ISLAND 4, N. Y.

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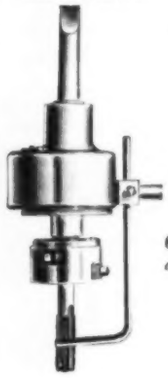
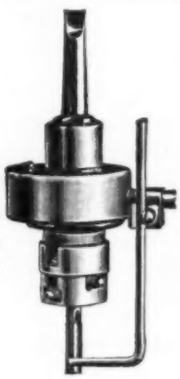
6701 N. Sioux Ave.

Size	Taps Exact Size
No. 00 H.S.	Up to 1/4"
" 00	1/8" 5/16"
" 0	3/16" 1/2"
" 1	5/16" 3/4"
" 2	3/8" 1 "
" 3	5/8" 1 1/4"
" 4	3/4" 1 1/2"
" 5	3/4" 2 "



Our High Speed Tappers are Super-Sensitive for Small Tapping



Style B Positive Stop Holds Work Down

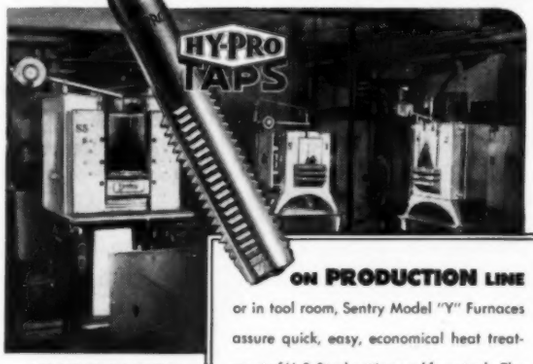
Style C Graduated Adjustable Safety Friction

DRILL PRESS TURRET

Style D-E with Quick-Change Tool Holders to Drill, Tap and Set studs, etc., without moving work, or stopping or reversing machine. Individual friction adjustment in each tapholder. If required. Also, Opening Die-Heads; Opening Stud-Setters; Friction Screw-Drivers and Nut-Setters, etc.

Sentry HIGH SPEED STEEL HARDENING FURNACES

PUT "SUSTAINED ACCURACY" AND "HIGH STAMINA" INTO HY-PRO TAPS



3 OF 5 SENTRY FURNACES IN THE PLANT OF HY-PRO TOOL CO., NEW BEDFORD, MASS., MAKERS OF HY-PRO TAPS

ON PRODUCTION LINE or in tool room, Sentry Model "Y" Furnaces assure quick, easy, economical heat treatment of H. S. Steel cutting and form tools. The Sentry Diamond Block Method of maintaining a neutral atmosphere permits soaking of high alloy steels to obtain full hardness and proper structure without danger of surface oxidation, reduction in size or decarburization. Resultant tools will show increased production capacity, high resistance to breakage and long life.

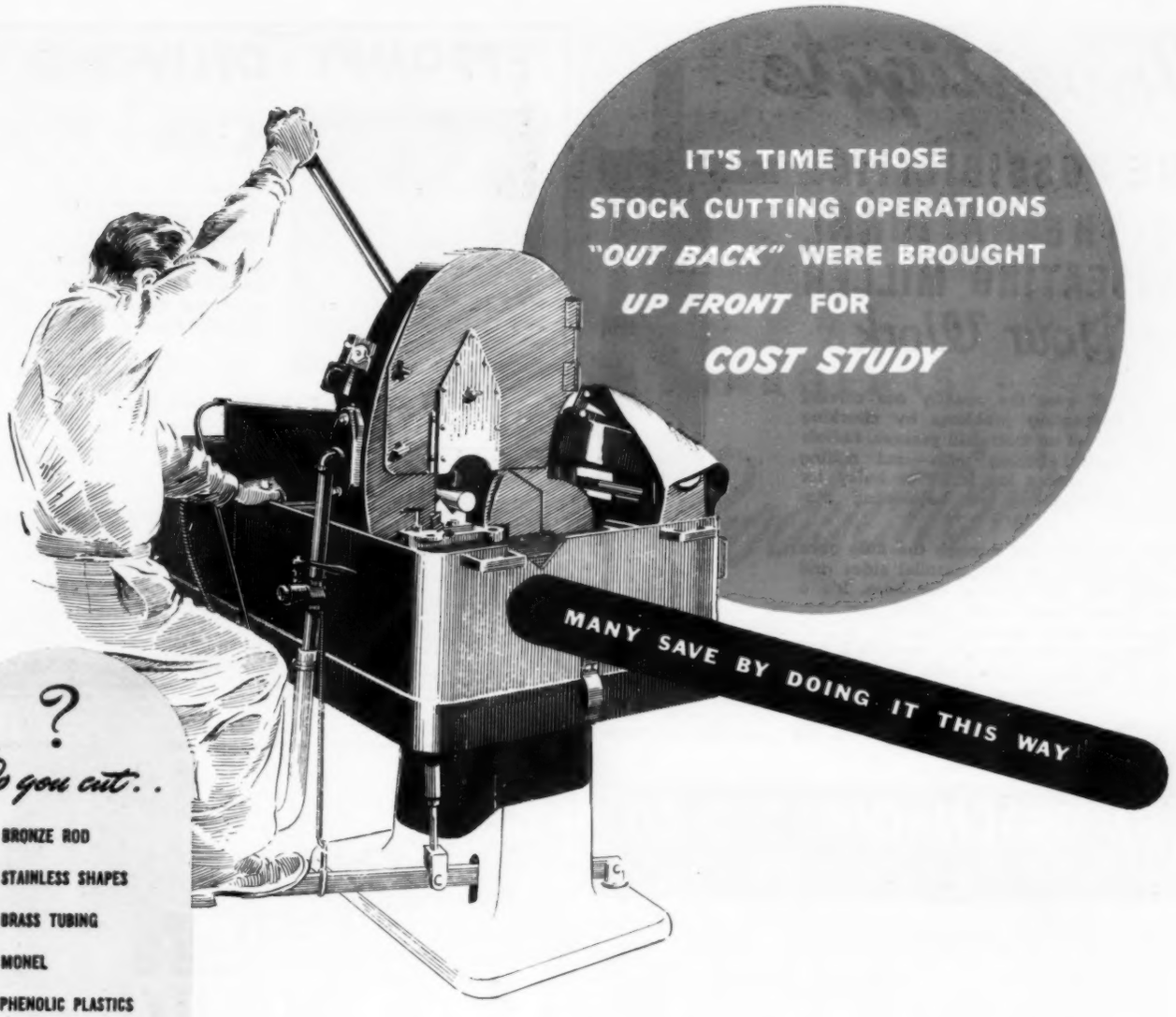
Investigate Sentry Today!

FOR THE MANY ADVANTAGES IN HIGH SPEED STEEL HARDENING.

WRITE FOR BULLETIN 1054-F11

The Sentry Company

FOXBORO, MASS., U.S.A.



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STAINLESS SHAPES
BRASS TUBING
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PHENOLIC PLASTICS
GLASS BOTTLES
TUNGSTEN WIRE
VALVE STEMS
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IF SO, *Check* AND CALL FOR AN

Allison
ABRASIVE
CUTTING
EXPERT

THE RIGHT WHEEL FOR ANY MACHINE

Do you cut rod or bar stock for machining . . . tube for rings . . . shapes for unit parts? Have you had trouble cutting or slitting tough materials like tungsten, unannealed steel, plastics, glass, ceramics? If so, we repeat, it's time your cutting problems were studied for potential cost savings . . . in the light of specialized knowledge of abrasive cutting methods.

Abrasive cutting times are reckoned in SECONDS. Abrasive wheels . . . correctly selected for the job . . . cut to size within thousandths . . . leave a FINISHED surface with minimum burr . . . handle hardest materials easily.

Allison Abrasive Wheel Specialists study your problem specifically . . . bring you a wealth of cost and experience data . . . fit the wheel and the method to YOUR PARTICULAR JOB. Investigation costs nothing, simply write or call Allison.

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Allison
ABRASIVE CUTTING WHEELS

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Investigate

THE POSSIBILITIES OF THE NATIONAL KEYSEATING MILLER on Your Work

• Shops all over the country are solving difficult keyseating problems by chucking this attachment on their drill presses, radials and horizontal boring mills—and milling keyseats in pieces too large or bulky for convenient handling on keyseating machines.

The "National" goes through the hole once and mills keyseats with parallel sides and parallel with the axis of the bore. It's a big time and money saver and is available in standard stock diameters from ½" to 3½" for cutting lengths from 1⅞" to 12". It will keyseat in blind holes, and offset holes. We also manufacture oil-grooving millers.

Several widths of cutters can be used with each size miller and many different hole diameters keyseated with one tool through the use of eccentric bushings.

WRITE today for Catalog No. 16

NATIONAL MACHINE TOOL CO.
CINCINNATI 22, OHIO

Unexcelled Performance
on all metal cutting operations...
RUTHMAN GUSHER
COOLANT PUMPS

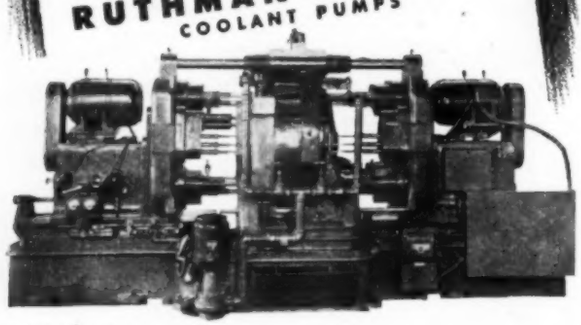

Photo Courtesy Morris Machine Tool Company

Expertly designed, precision built, Ruthman Gusher Coolant Pumps give year after year of unexcelled performance. Less vibration, fewer parts to wear guarantee a long trouble-free life for Ruthman Gusher Pumps on your metal cutting equipment. Illustrated above is a Morris Two-Way Drilling, Boring, and Reaming Machine with 44 spindles mounted in Cluster Heads; equipped with Model 11024 Short Ruthman Gusher Coolant Pump.

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ONLY the PATENTED construction of LUERS cutting off BLADES permits normal expansion of bursting chips — MEANS MAXIMUM CUTTING EFFICIENCY.

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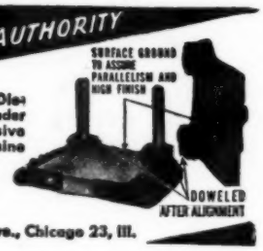

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You can score a "bullseye" in *high production with precision* . . . by putting the work on Kent-Owens Milling Machines!

Shop records show there's steady output without costly downtime with Kent-Owens Machines. Designed for rapid, easy set-up and operation. Efficient . . . rugged . . . dependable . . . with practical features that save job-time and labor. Write for bulletins on the Kent-Owens Standard line . . . including wide range of hydraulic and hand operated machines.

Also, let our engineers help you with special machine requirements.

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No. 2-20 Milling Machine
Table, 42" x 12"
Table Travel, 20"

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MACHINE COMPANY
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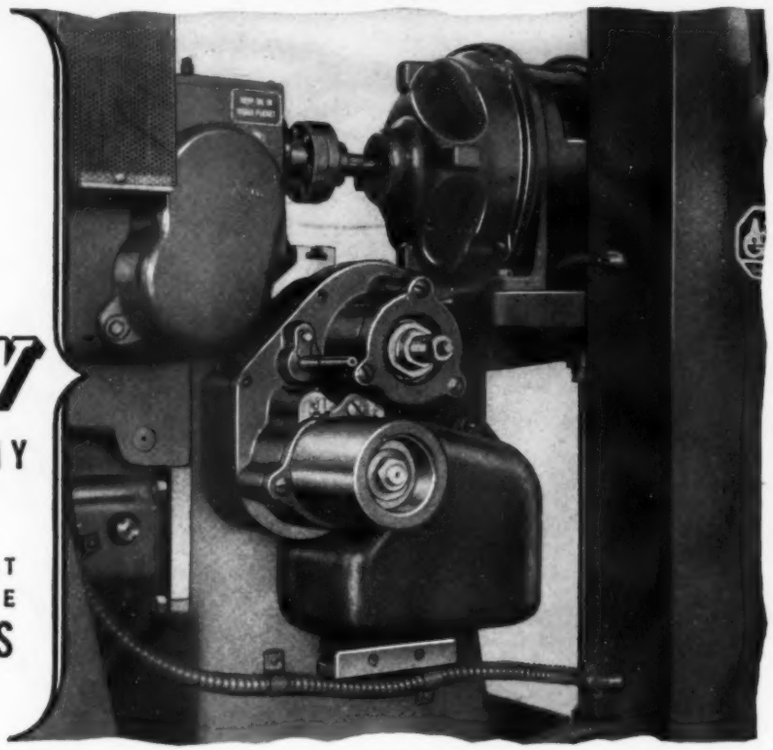
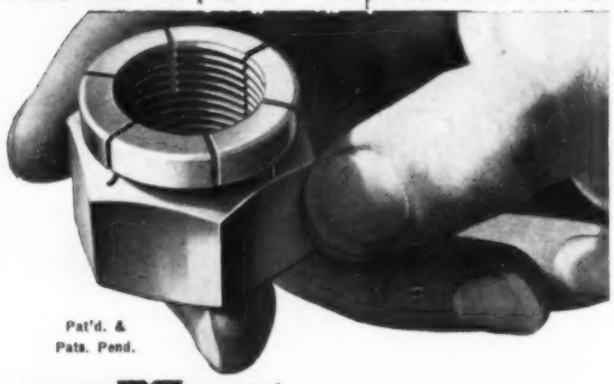
THE WORLD'S FINEST
MULTIPLE SPINDLE
CHUCKING MACHINES



ASK FOR SAMPLES



Pat'd. &
Pats. Pend.

FLEXLOC ONE-PIECE

SELF-LOCKING NUTS

The one-piece, all-metal, resilient "Flexloc" is becoming widely accepted, because it is processed to have an exceptionally uniform torque, and because it is a stop, a lock and a plain nut all in one.

All its threads are "live" and load-carrying; "Flexloc" accommodates itself to a wide range of thread tolerances, and can be used over and over again without losing much of its torque . . . is not affected by temperatures commonly met within the industrial field of Mechanical Engineering . . . and being a "stop" nut, it stays locked in any position on a threaded member . . . and last, but not least—it won't shake loose!

The *Thin* "Flexloc" has become very popular because its *tensile* is so high and the space it occupies so small.

Sizes from #6 to 2" in diameter—in "regular" and "thin" types—in NC and NF thread series. Write for *"Flexloc" Catalog.*

OVER 45 YEARS IN BUSINESS

STANDARD PRESSED STEEL CO.

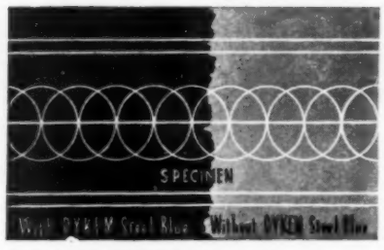
JENKINTOWN, PA. BOX 4

Chicago • Detroit • Indianapolis • St. Louis • San Francisco

DYKEM STEEL BLUE

STOPS LOSSES

making dies & templates



Simply brush on right at the bench; ready for the layout in a few minutes. The dark blue background makes the scribed layout lines show up in sharp relief, and at the same time prevents metal glare. Increases efficiency and accuracy.

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THE DYKEM COMPANY, 2301 B North 11 St., St. Louis, Mo.
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RIVETERS — PIONEERS in their line—head rivets from smallest to ⅝" diameter either by NOISELESS SPINNING or VIBRATING HAMMER method—Sizes to meet all needs—Types include Vertical and Horizontal Multiple Spindles.

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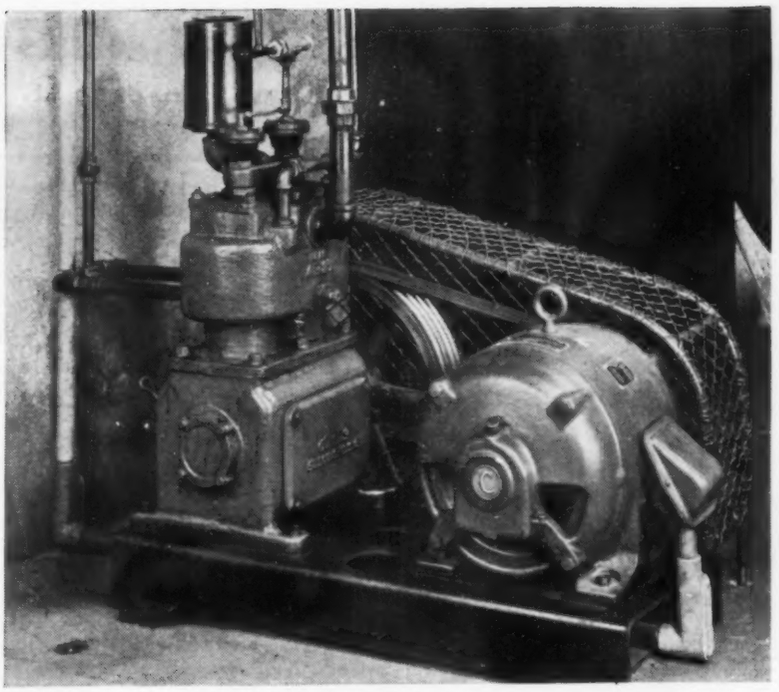
THE GRANT MFG. & MACHINE CO.
85 Silliman Ave., Bridgeport, Conn., U. S. A.

Curtis Timken Bearing Air Compressor. Sizes from ¼ to 50 H. P., inclusive.



RELIABILITY
That Pays Off in Low-Cost Performance

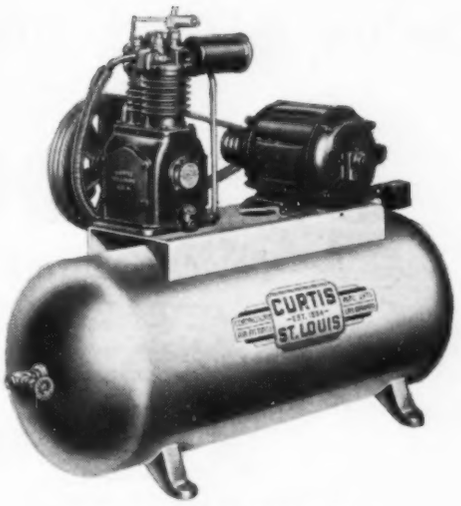
CURTIS TIMKEN BEARING AIR COMPRESSORS

WHATEVER the application, in thousands of varied industrial installations, Curtis Timken Bearing Equipped Air Compressors have a long and proven record of extreme reliability, low maintenance expense and unusually long life.

Every Curtis Air Compressor has been carefully engineered, made of the highest quality materials and precision built throughout.

Their dependable, economical performance is the result of such design advantages as:

- Timken Roller Bearings
- Self-Oiling—Positive Lubrication
- Carbon-Free Disc Valves
- Automatic Pressure Unloader
- Fully Enclosed Design
- Precision Construction



Curtis Timken Bearing Air Compressor with tank. Sizes from ¼ to 10 H.P., inclusive.

Specify CURTIS when you want a reliable, low-cost supply of air for *any* use. Capacities from ¼ to 50 H.P. (up to 300 CFM).

Write today for full information on Curtis Air Compressors, Air Hoists and Air Cylinders—or mail the coupon below.

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PNEUMATIC MACHINERY DIVISION

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94 Years of Precision Manufacturing

CURTIS PNEUMATIC MACHINERY DIVISION *of Curtis Manufacturing Company*
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Please send me Form C-7 on Curtis Air Hoists, Air Cylinders and Curtis Air Compressors.

Name.....
Firm.....
Address.....
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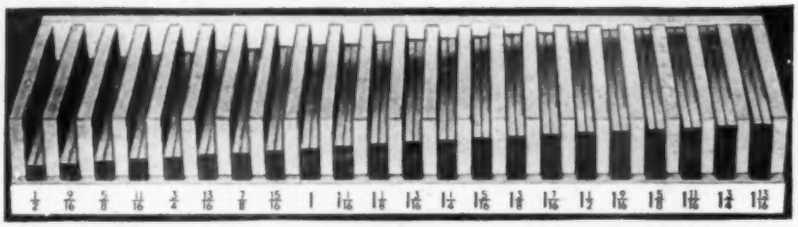
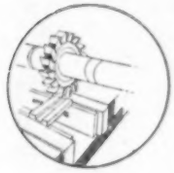
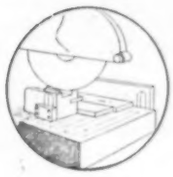
announcing the NEW ANTON .0001 'PRECISION' PARALLELS . . .



Use for Set Up . . . for Production . . . as Gauge Blocks





Anton "Precision" Parallels, furnished in a complete range of sizes, are guaranteed to "tenths" in size and parallelism and in straightness, are permanently accurate and have a Rockwell "C" hardness 65 up. They meet all requirements for tool room or production. Accuracy allows use as gauge blocks for measurements in thousandths. The following sets are now available:

22 pairs, ¼" thick x 6" long, ½" to 1-13/16" in 1/16" steps ..... Price $124.00

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All prices F.O.B. New York and include boxing of each set in a convenient wooden case.

Anton Standard Parallels to commercial tolerances also available.

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4, 5, 6 FOOT;
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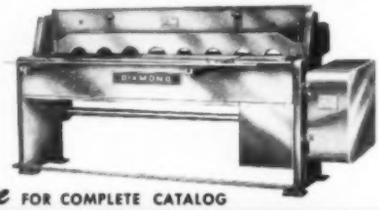

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Maximum Gripping Power with Extreme Accuracy and Long Life

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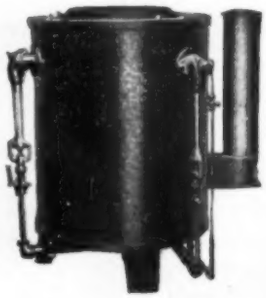
T. R. ALMOND MFG. CO.

Ashburnham, Mass., U.S.A.

Atmospheric Pot Hardening Furnace



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. . . are the efficient, economical answer to today's Heat Treating Problems. *NO BLOWER or OTHER AUXILIARY POWER are needed . . . just connect to your gas supply.*

• The Full Muffle Furnace attains a temperature of 2400° F., and The Pot Hardening Furnace, tangentially fired to assure even heat up 1650° F., are two of many models available.

• Send for the new "BUZZER" Catalog showing full line of Industrial Gas Furnaces, Burners and other equipment.

CHARLES A. HONES, INC.

121 So. Grand Ave. Baldwin, L. I., N. Y.

Full Muffle Furnace

HERE IT IS!

A LARGER MORE POWERFUL ROTARY ELECTRIC IMPACTOOL

Size 8U

A REAL MULTI-PURPOSE TOOL

- Taps
- Runs Nuts
- Reams
- Drills
- Runs Hole Saws
- Drives and Removes Studs
- Drills Masonry
- Extracts Broken Studs
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- Runs Wire Brushes
- Bores Wood

The *new, larger,* multi-purpose Impactool, Size 8U is a big brother to the 4U and does everything—in a bigger way! Now you can run nuts up to ⅝" bolt size, drill up to ⅜", tap up to ¾", drive screws up to ⅝", drive and remove studs up to ⅝", etc.... all without any kick or twist to you!

The amazing performance of the Ingersoll-Rand electric Impactool is hard to believe unless you see it in action—it saves up to 90% on nut running time —has full power in either direction—no motor burn-outs, motor continues to run even if spindle is stalled —it is the greatest labor-aiding, time-saving electric tool ever offered.

Start saving money now by calling your Ingersoll-Rand distributor for a demonstration of the electric tool everyone is talking about—the Impactool.

Both sizes are available for immediate delivery.

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VITRIFIED GRINDING WHEELS

The Vitrified complete line includes also Silicate, Shellac and Resinoid bonded wheels for conditions requiring high finish, elasticity and heat resistance.

Vitrified Wheels

Grinding equipment—for tools or for production requirements—can be brought to higher degrees of precision and speed by standardization of Grinding Wheels.

These objectives can easily be realized through the use of Vitrified Wheels for every grinding operation, because Vitrified offers a complete line of sizes, shapes and types, processed especially for the work to be handled.

. . . Cast Iron, Bronze, etc., can be ground at low cost and efficiency on Vitrified Carborite Wheels.

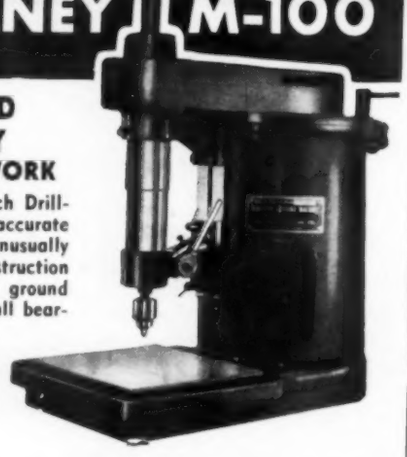
. . . For accurate, fast grinding of steel on a production basis, Vitrified Borite Grinding Wheels increase output and reduce costs.

. . . also, make Silicate, Shellac and Resinoid Bonded Wheels.

Ask a Vitrified representative to show you how economically you can modernize your grinding operations by standardizing on Vitrified Wheels.

VITRIFIED WHEEL CO.
WESTFIELD MASS.

SIGOURNEY M-100



MAINTAINED ACCURACY IN PRECISION WORK

The Sigourney M-100 Bench Drilling Machine is extremely accurate on precision jobs. It is unusually sturdy and rigid in construction . . . has hardened and ground spindles . . . and sealed ball bearings throughout. All moving parts are entirely closed for maximum operator safety. M-100 is built for long and steady service.

This sturdily constructed bench drilling machine is available in 1, 2, 3, and 4 spindle models . . . speeds from 4,000 to 10,000 r.p.m.

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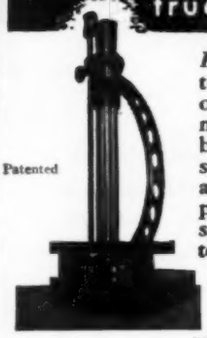
Hartford 6, Conn.

Sole Sales Agents
PRATT & WHITNEY
Division Niles - Bement - Pond Co. — West Hartford, Connecticut

Any MICROMETER 1" to 18" size trued and lapped square



Patented

Pearson Precision "Micrometer Lapping Fixture" gives your plant constant *exact check* on all micrometers. Any good toolroom man can operate it expertly. No disassembling of micrometer other than removing spindle. Laps micrometer in exact right angle with center line of spindle; and in perfect alignment with end of micrometer spindle. Also makes an excellent comparator. Saving an hour's rejects may more than pay for this fixture. "This fixture will also accurately lap adjusting snap gauges with addition of a new holding bracket."

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WASHERS on Tap as You Need Them

When You Make Them The HOVIS Way

Simply invest in HOVIS UNIVERSAL MASTER WASHER DIES. Then 5 small easily removable parts are all you need to change to make a new size washer.

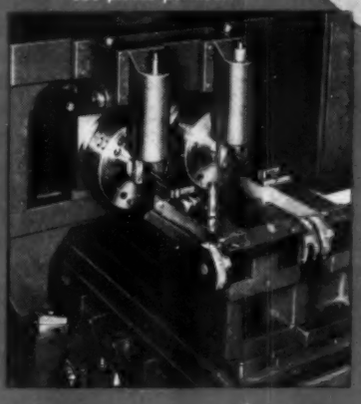
• You can also use the Hovis Master Washer Die as a holder for making various blanks in your own die room, eliminating the cost of new die sets.

HOVIS SCREWLOCK COMPANY
8098 E. Nine-Mile Rd., Van Dyke, Mich.
Suburb of Detroit

EX-CELL-O CAN GIVE YOU MORE ECONOMICAL PRODUCTION

Above: Full view of Ex-Cell-O Style 2112-A Precision Boring Machine arranged for automatic rough and finish boring of valve guide bushings. Parts enter chutes at left end of spindles, are fed through hollow spindle shafts to chucks, are rough and finish bored and ejected, all automatically, at the rate of *300 pieces per hour.*

Above: Automotive valve guide bushings with 11/32" holes, 2-3/16" long that are rough and finish bored on the machine shown above left.



Left: Close-up view of spindles and boring bar supports. Vertical castings in front of chucks house locating plungers that, when lowered, limit the forward travel of the bushings. Locators are withdrawn during boring and ejecting portions of cycle. Graduated dials on boring bar supports permit accurate adjustment of boring bar to control size of hole.

THIS ENTIRELY AUTOMATIC PRECISION BORING MACHINE IS TYPICAL OF EX-CELL-O SUPERIORITY IN ENGINEERING

● **Here's a machine that receives automotive valve guide bushings from a conveyor line, rough and finish bores them and delivers them to another conveyor, all automatically. The bushings, 2-3/16" long with 11/32" bores, enter chutes at the left end of the spindles, are fed through the hollow spindle shafts to the chucks, are located, clamped, rough and finish bored and ejected at the rate of *300 pieces per hour.* Bores are held to a tolerance of .001". The operator need never touch the parts except to inspect the bores occasionally.**

The engineering know-how that makes possible an automatic machine such as this one is always available to Ex-Cell-O customers, whether their work requires parts in short runs or great volume. Whether tolerances are measured in thousandths or ten-thousandths, Ex-Cell-O engineers will suggest the most practical and efficient method of finishing your parts. Call Ex-Cell-O today!

EX-CELL-O CORPORATION

DETROIT 32, MICHIGAN

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EX-CELL-O *for* PRECISION

Special Multiple Way-Type Precision Boring Machines • Special Multiple Precision Drilling Machines • Precision Boring, Turning, and Facing Machines and Fixtures • Precision Cylinder Boring Machines • Precision Thread Grinding Machines • Precision Lapping Machines • Precision Broach Sharpening Machines • Other Special Purpose Machines • Tool Grinders • Continental Cutting Tools • Broaches and Broach Fixtures • Counterbore Sets • Grinding Spindles • Hydraulic Power Units • Drill Jig Bushings • R.R. Pins and Bushings • Fuel Injection Equipment • Dairy Equipment • Aircraft and Miscellaneous Production Parts

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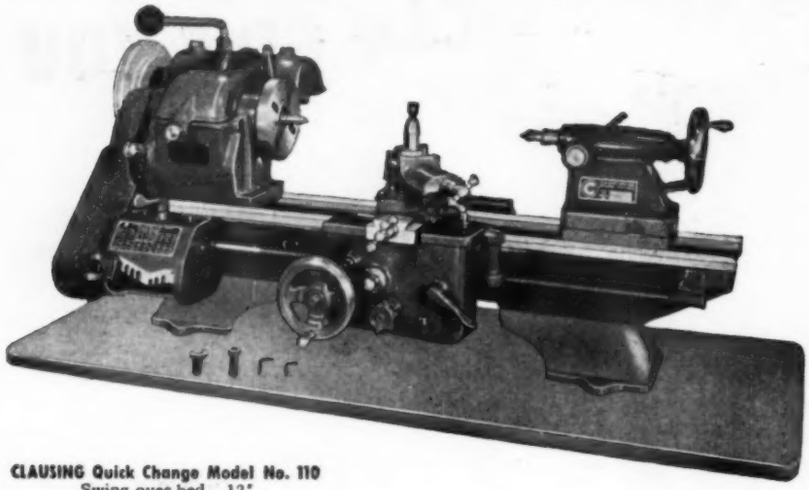

CLAUSING Quick Change Model No. 110
Swing over bed—12"
Swing over carriage—7½"
Distance between centers—24"

Accuracy THAT "STAYS PUT"

Exacting users prefer CLAUSING Lathes because of their adaptability, convenience, and sustained accuracy even after years of service.

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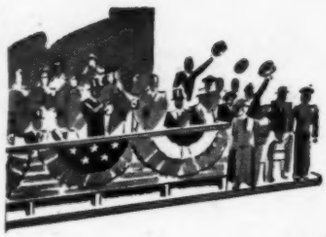

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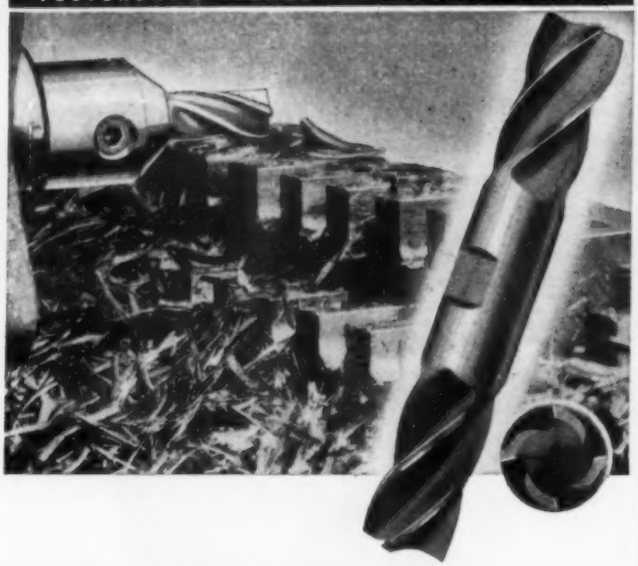

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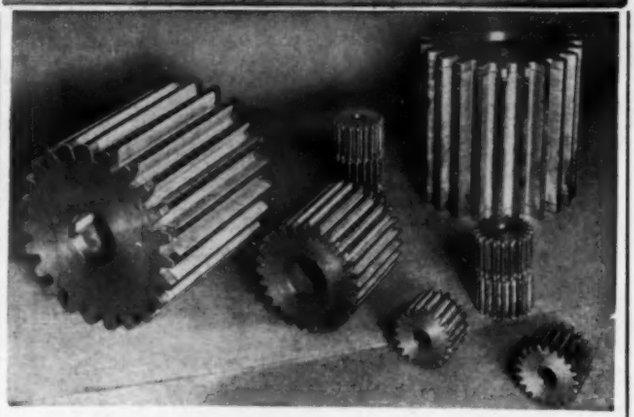

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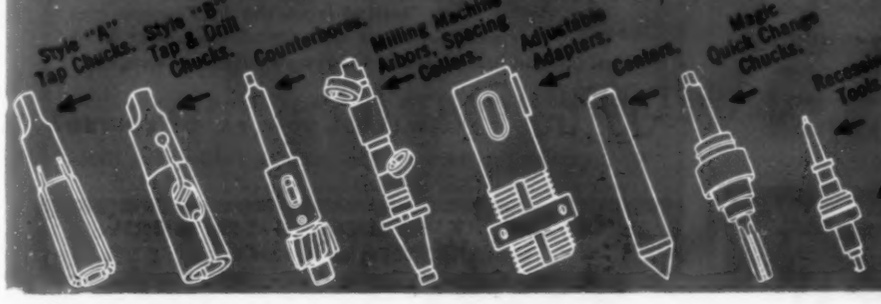

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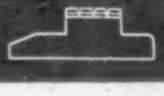

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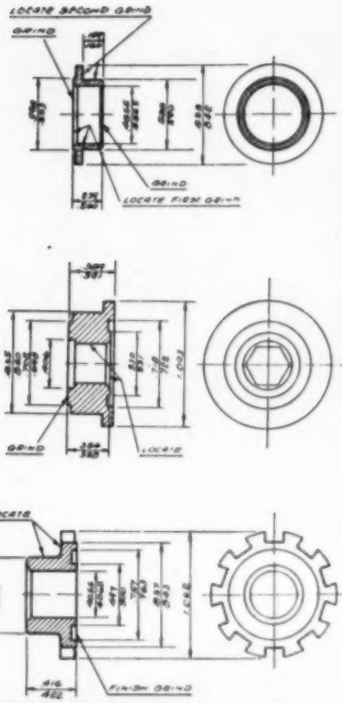

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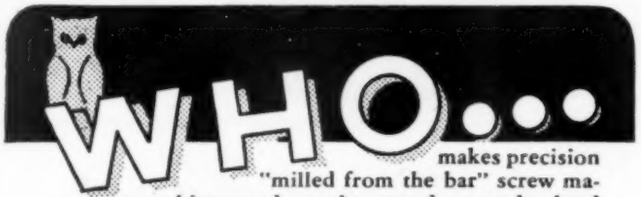

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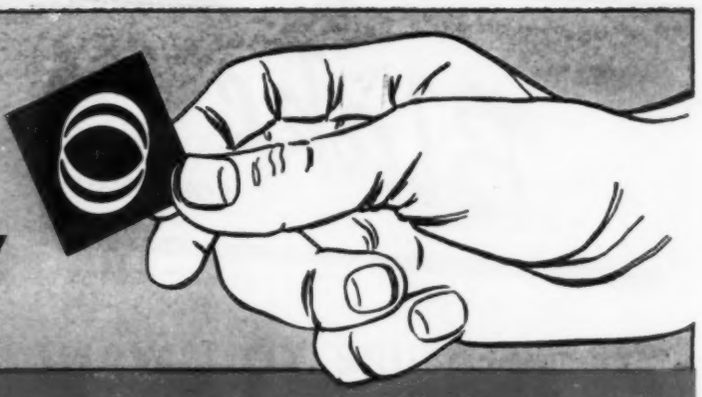

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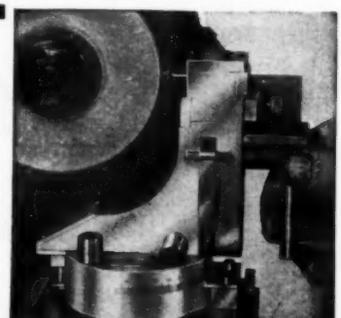

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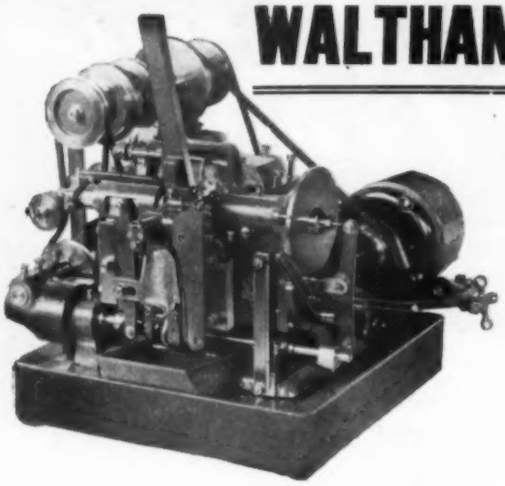

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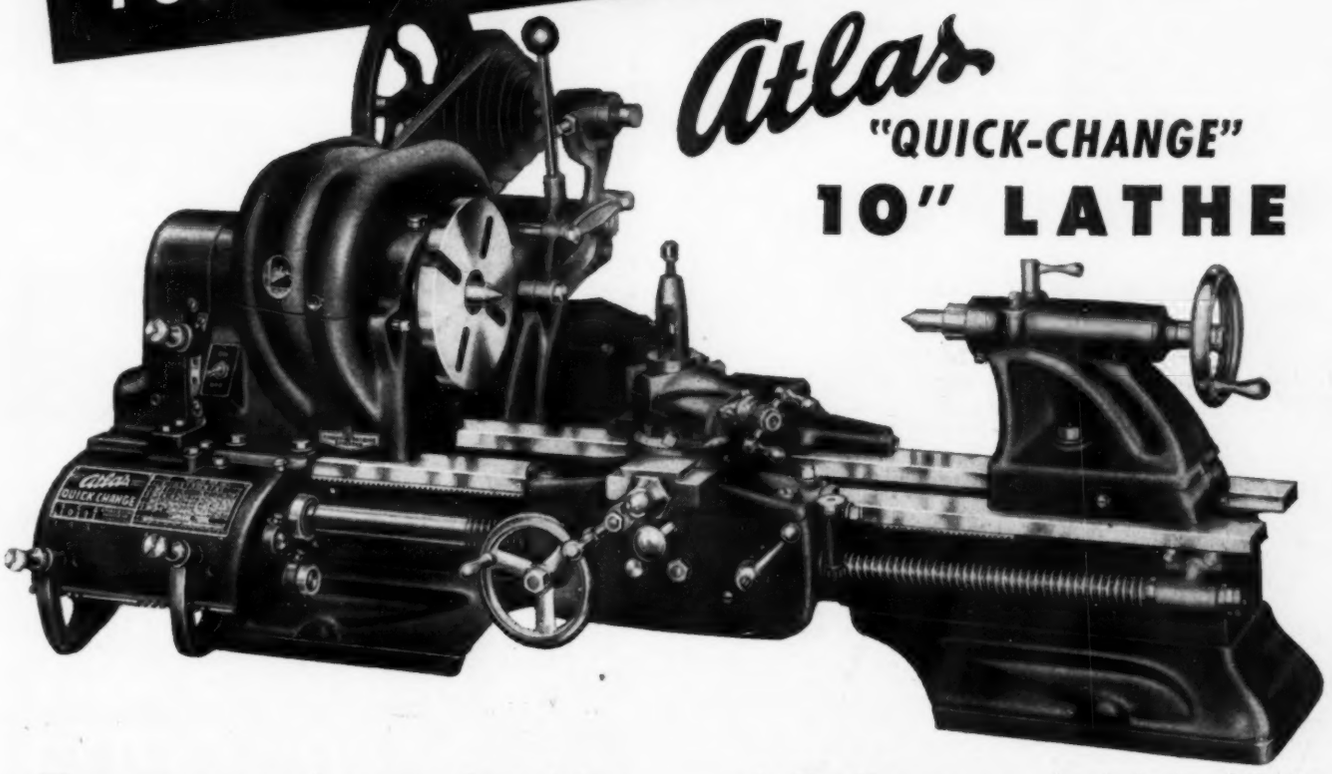

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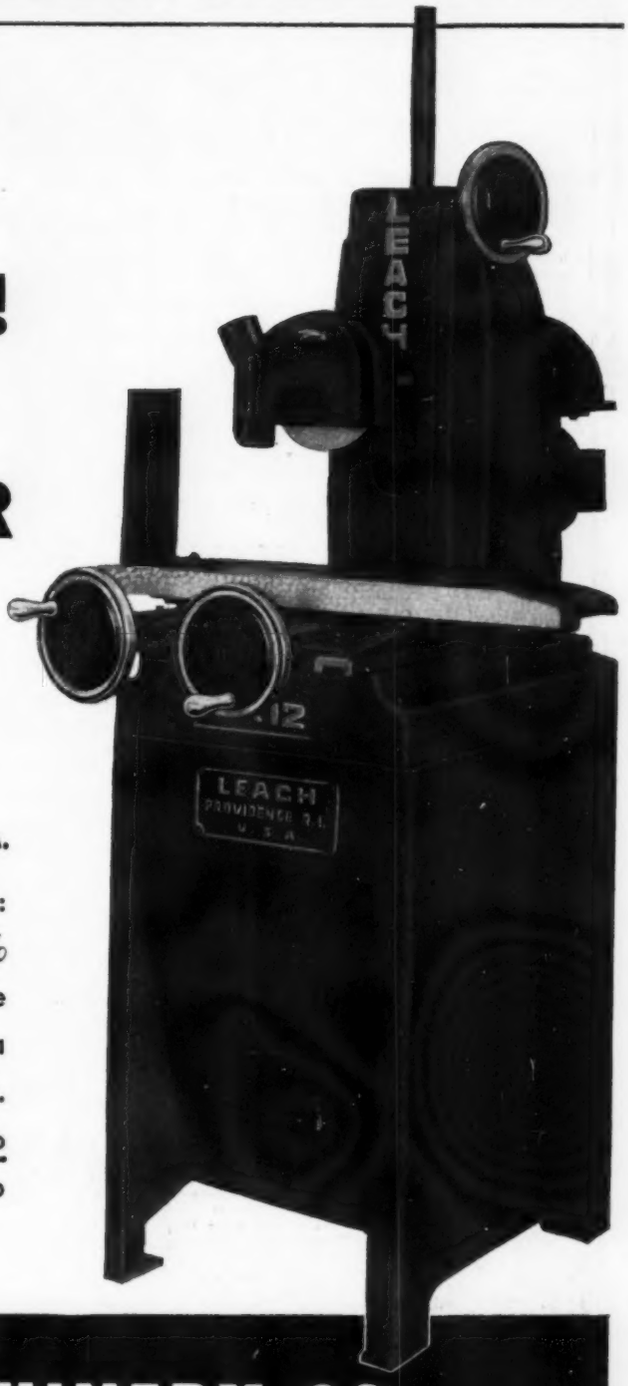

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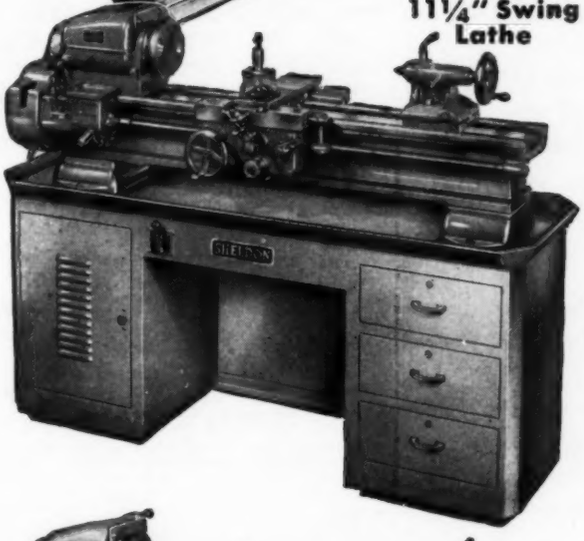

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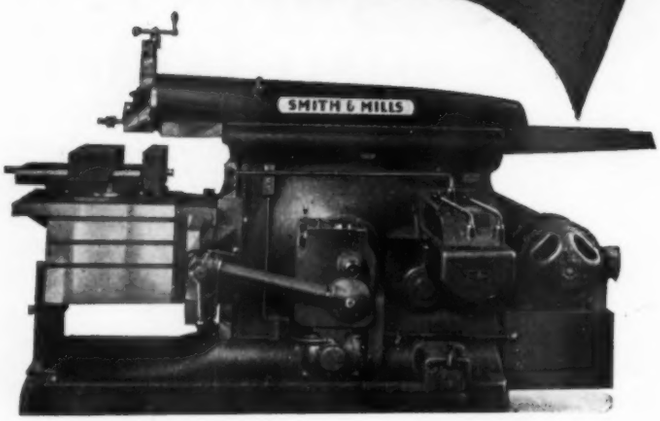

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11/32	11/16	4	9/32	6	4.25
3/8	11/16	4	5/16	7	4.25
13/32	11/16	4	5/16	7	4.75
7/16	11/16	4	3/8	7	4.75
15/32	1	4	3/8	7	5.00
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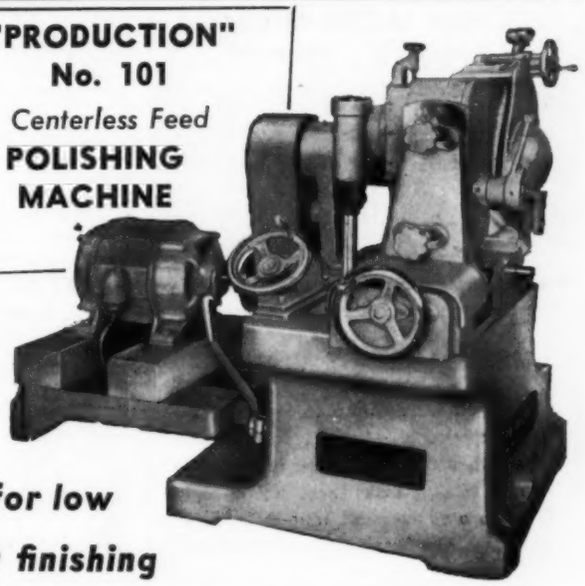

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AUCTION ON PAGE 277

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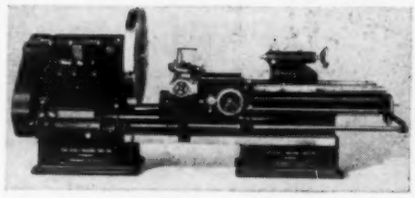

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Michigan O.B.I. 36 tons cap. 2" stroke. Wide Ram, wide Bed. Motor driven
Bliss No. 68C Dbl. Action, Gap Frame.
Lucas 15 tons, Power Arbor Press. M. Dr.
Hub O.B.I. 15 tons, 2" stroke, M. Dr.
Tompkins & Johnson Power Arbor Press. 3½" Stroke. Cap. 6500#
McCall No. 4 O.B.I. 2½" stroke, 25 tons.
NEW Johnson O.B.I. Presses. Al Isizes.
Bliss #305 Geared S.S. Single Action
Nilson 56 tons S.S. Dbl. Crank 3-Die Transfer Press
Bliss #18, #20 O.B.I. Motorized

SHEARS

Bliss #109 Slitter, 10 ga. cap.
Pexto #571 Slitter, 3/16" cap.
Wais & Roos 10' x ¼", 15' gap.
NEW Famco 36"x18 ga. Squaring
Pexto Foot squaring 30" x 22 ga.
Ohl 6' x 14 ga. Motor driven Squaring Shear. With gauges & extra blades.

Sutton #2 Straightening Machine. Cap. ¾" to 3½" tubes or solids. 50 h.p. 3/60/220 volts motor drive.

BROACH

Oilgear, Horizontal Hydraulic Type #XA. Capacity —20,000#, 56" stroke. Motor driven. Coolant system and hydraulic system

MILLING MACHINES

Vernon #0 Hand, Late Type, M.D.
Nichols Hand, Late Type, M.D.
Sundstrand #0 Rigidmil, M.D.
Whitney #6 Hand, Cone Drive
Hardinge B.B. Vertical, Bench
Bickett #1 B.B. Vertical, Bench
Ames Universal Horiz. Bench
Becker #5C Vertical, Cone Dr.
Knight #1½C Vertical
Cincinnati #3 & #4 Vertical
Cincinnati #2 Univ. Horizontal
Cincinnati #3S Univ., Horizontal
Cincinnati #3, #4, #5 Pl. Horiz.
Cincinnati #2M Univ. Horiz.
Brown & Sharpe #0, 1, 1Y Horizontal
Brown & Sharpe #2 Univ. Horiz.
Brown & Sharpe #1D Univ. Horiz.
Brown & Sharpe #3 Univ. Horiz.
Kempsmith #1, #2 Plain Horiz.
Cincinnati 18" Mfg. Plain
Garvin #14 Plain Horizontal
Milwaukee #2K Vertical, M. Dr.
Milwaukee #3K Vertical, M. Dr.
Milwaukee #1½ Dbl. Overarm, Horiz.
Milwaukee #2B Dbl. Overarm, Horiz.
Milwaukee #2B Universal Horiz.
Milwaukee #3B Plain Horizontal
Brown & Sharpe #12 Production, M. Dr.
Pratt & Whitney #2 Duplex, Motorized
Van Norman #2 Duplex, Motorized
Cincinnati #0-8 Vertical, M. Dr.
Cincinnati #0-8 Plain Automatic
Cincinnati #0-8 Rise & Fall
Cincinnati #2-18 Plain Automatic

Cincinnati #5 Horizontal Hi Power Milling Machine. With rectangular overarm. All geared speeds & feeds. Single pulley drive. Range—50'x14"x21". Immediate Delivery, (2 Available.)

SHAPERS & PLANERS

Shaper—Logan 7" Horizontal. NEW
Shaper—Machinery Sales 16", motorized
Shaper—Gould & Eberhardt 16", motorized
Shaper—Smith & Mills 16", motorized
Shaper—Smith & Mills 16" Universal
Shaper—Potter & Johnston 16", Universal
Shaper—Gould & Eberhardt 18" B.G. Crank
Shaper—American 24" crank, motorized
Shaper—Columbia 32" B.G. Crank. Gearbox
New Haven 12" Slotter, motorized
Planer—Whitcombe 24x24x6 motorized
Planer—Shaper—Niles-B. Pond 20x20x24
Planer—Betts 72x60x30 Modern 4-Head
Planer—Betts 72x60x25 Modern 4-Head
Planer—Betts 122x72x34 Modern 4-Head

DRILLING MACHINES

American 8' Triple Purpose Radial, M. Dr.
Cinci-Bickford 6' Arm, 15" col. Radial
Cinci-Bickford 5' Arm, 13" col. Radial
Demco 4-Spindle Drill #2 M. T. M. Dr.
Fosdick 5" Arm 14" col. Radial
Natco #12, 20 Spdle. Multiple, 3/16" cap.
Fox #15, 54 Spdle. Multiple, #1 M.T.
Minster #2D Single Spindle Upright Heavy Duty 2½" cap. Compound Table. Motorized
Canedy-Otto 21" Single Spdle. Late Type
Cinci-Bickford 21" Drilling & Tapping, #3 m.t.
Buffalo Forge #2MS Drill. Late Type
Barnes 22" Backgeared Upright Single Spdle.
Leland-Gifford #2MS, 2-Spindle Upright
Edlund #2B, 4-Spindle Upright, #2 m.t.
NEW Buffalo Forge #15, #18 Single Spdles.

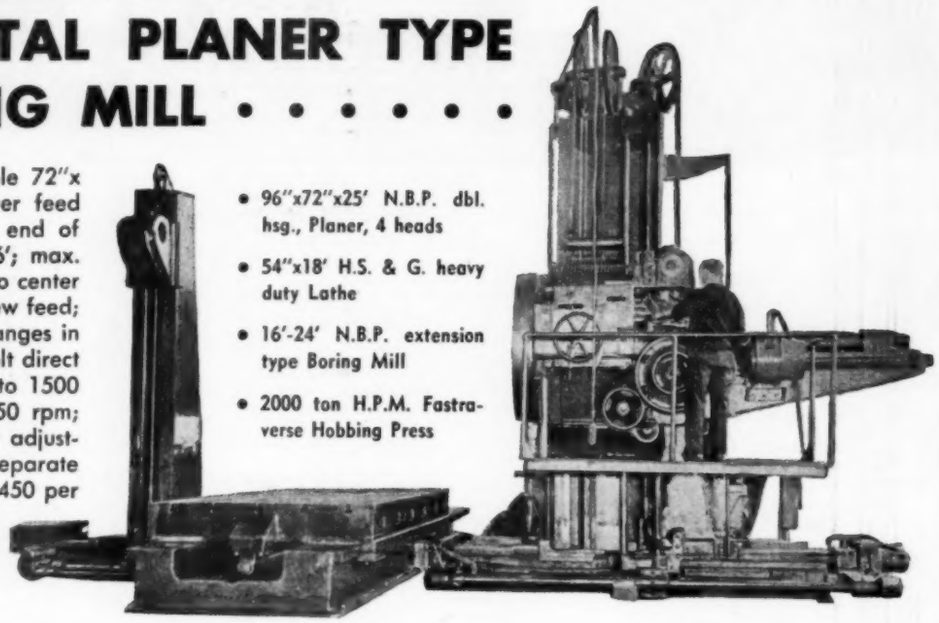
Bradley 200# Rubber Cushioned Helve Hammer. Single pulley drive. 225 to 240 blows per minute. Stroke adjustable from 1" to 5½". Separate adjustable anvil. Total weight—10,200#. Price—$1850.00 net fob Rochester, N. Y.

EMERMAN offers from STOCK

7" DETRICK & HARVEY

HORIZONTAL PLANER TYPE BORING MILL . . . . . .

● Working surface of table 72"x 144"; Travel of table power feed 10'2"; max. distance from end of spindle to outer support 16'; max. distance from top of table to center of spindle 8'2"; Bar has screw feed; has 4 mechanical speed changes in gearbox and 35 HP, 220 volt direct variable speed motor, 500 to 1500 rpm; spindle speed 1 to 450 rpm; outer support has 5' power adjustment on outer way with separate motor; feed range .010 to .450 per rev of spindle; with power feed in all directions to table and head on upright.



- 96"x72"x25' N.B.P. dbl. hsg., Planer, 4 heads
- 54"x18' H.S. & G. heavy duty Lathe
- 16'-24' N.B.P. extension type Boring Mill
- 2000 ton H.P.M. Fastraverse Hobbing Press

EMERMAN MACHINERY CORP.

875 W. 120TH STREET — CHICAGO 43, ILLINOIS

NEW— SURPLUS

TUNGSTEN CARBIDE TIPPED SIDE MILLING CUTTERS

3" x ¼" x 1"	$ 8.13
3" x 5/16" x 1"	8.13
3" x ⅜" x 1"	8.13
3" x ½" x 1"	8.13
4" x 5/16" x 1"	12.50
4" x ⅜" x 1"	12.50
4" x ½" x 1"	12.50
4" x 9/16" x 1"	12.50
4" x ⅝" x 1"	12.50
4" x ¾" x 1"	12.50
5" x ½" x 1" or 1¼"	15.63
5" x 9/16" x 1" or 1¼"	15.63
5" x ⅜" x 1" or 1¼"	15.63
5" x ¾" x 1" or 1¼"	15.63
6" x ½" x 1" or 1¼"	18.75
6" x ⅝" x 1" or 1¼"	18.75
6" x ¾" x 1" or 1¼"	18.75
8" x ¾" x 1" or 1¼"	25.00
8" x 1" x 1" or 1¼"	25.00

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CAnal 6-5575

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OF PROVIDENCE

OFFERS

#4 Fellows Enveloping Gear Generator 220/3/60

#3 VG Reed Prentice Vertical Miller 15" Rotary Table 220/3/60

#2 B & S Vertical Miller, Motor in base

16" & 20" Lodge & Shipley Geared Head Lathes 550/3/60

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MACHINERY COMPANY
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BARGAINS!
SURPLUS EQUIPMENT

AJAX 1½", 3½", Upsetter, M.D.
BRIDGEFORD 36x24' Centers Engine Lathe, M.D.
BULLARD 16" 6 and 8 spindle Mult-au-matic Type D Single Indexing, New 1943
CINCINNATI #3, #4 Vertical Milling Machine, Geared Motor Drive
CINCINNATI #3 Centerless Grinder, M.D.
CLEARING 50 ton Hyd. Press—New 1940
CRANES from 5 to 30 ton capacity all 230 volts, DC current
FRANKLIN 4¼" Bar Horizontal Boring Mill Table Type Motor Drive
JONES & LAMSON "Fay" 20x25 Centers Production Lathe, New 1941
LoSWING 8x108" Centers Production Lathe, New 1941

NIAGARA 1000, 1200 KVA Transformers, New 1941

NILES 30x50' Bed Boring Lathe, New 1941
NILES 72x63' Centers, Combination Boring and Turning Lathe, Motor Drive
NILES 48"x48"x16' Planer, A.C., M.D.
NILES 200 Ton Wheel Press, Motor Drive
PUTNAM 42"x25' Centers Engine Lathe, M.D.
SCHUMACHER & BOYE 24"x158" Centers, Geared, Motor Drive
SUNDSTRAND #3A Duplex Miller—40" feed, tion Lathe, New 1941
VAN NORMAN #3 Duplex Universal Miller

CINCINNATI No. 4 Plain Milling Machine, Geared, Timken Bearing
KEARNEY & TRECKER No. 4 Plain Milling Machine, Geared, Timken Bearing
WARNER & SWASEY #5 Universal Turret Lathe, Timken Bearing

This is a partial listing.

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Over 2000 Machine Tools Ready to Ship

AUTOMATICS

8 spindle 1⅝" Cone, m.d., latest
4 spindle 1¼" Conomatic, m.d., bar, 1942 machine
No. 5D2—12" Potter & Johnston, m.d., air chucks, 1944 machine
No. 5D2—15" Potter & Johnston, m.d., air chucks, 1944 machine
No. 6A Potter & Johnston, m.d.
No. 6C Potter & Johnston, m.d.
14" Fay, Flanders Type, m.d.
20x25" Jones & Lamson, m.d., latest
4 spindle ⅞" Model R-4 Acme-Gridley, m.d.
4 spindle ⅞" Cleveland Model M, m.d.
4 spindle 2" Cleveland Model M, m.d., bar
4 spindle 2¼" Cleveland Model K, m.d.
2¼" Gridley Single Spindle, m.d.
2½" Cleveland Model A, m.d.
4¼" Cleveland Model A, m.d.
5½" Cleveland Model A, m.d.
6" Cleveland Model A, m.d.
7¾" Cleveland Model A, m.d.

HORIZONTAL BORING MILLS

Morris Mor-Speed No. 5 Taper, m.d.
2½" Cleveland, m.d.
No. 25T Giddings & Lewis, m.d., 2½" bar, latest
No. 31 Lucas, 3" bar, m.d.
No. 33 Lucas, m.d., 4½" bar
No. 45 Giddings & Lewis, m.d., 5" bar
4" bar Detrick & Harvey Floor Type, m.d.
4" bar Landis Floor Type, m.d.
5½" bar Niles, m.d.
10" bar Sellers Floor Type, m.d.

VERTICAL BORING MILLS

24" Bullard, m.d., with side head
36" Bullard Spiral Drive, m.d., with side head
36" Bullard New Era, m.d., with side head
42" Bullard New Era, m.d., with side head
Bullard Spiral Drive, m.d., with side head
42" Colburn H.D., m.d., 2 swivel heads
48" Cincinnati Rapid Production, m.d., 1 turret, 1 swivel head
48" Colburn H.D., m.d., 1 turret, 1 swivel head
48" Putnam H.D., m.d., 2 swivel heads
52" King, m.d., 2 swivel heads
54" Colburn, m.d., 1 turret, 1 swivel head
84" Niles H.D., m.d., 2 swivel heads, p.r.t.
100" Niles Heavy, m.d., 2 swivel heads, p.r.t.
100" Niles Extra Heavy Pattern, m.d., 2 swivel heads, p.r.t. late
120" Niles Heavy, m.d., 2 swivel heads

PLAIN CYLINDRICAL GRINDERS

No. 5—3x18" Brown & Sharpe, m.d., latest
6x18" Cincinnati Hydraulic, m.d.
6x18" Landis Type C Hydraulic, m.d., late
6x18" Landis, m.d.
6x30" Cincinnati Hydraulic, m.d.
6x32" Fitchburg Type A, m.d., late
8x18" Cincinnati Saddle Type, m.d.
8x36" Cincinnati Saddle Type, m.d.
No. 10 Brown & Sharpe Self-Contained, m.d.
No. 11 Brown & Sharpe Self-Contained, m.d.
10x24" Landis, m.d.
10x36" Cincinnati Hydraulic, m.d.
10x48" Brown & Sharpe, belt
10x72" Brown & Sharpe, belt
10x72" Landis, m.d.
12x36" Landis, m.d.
12x48" Cincinnati Plain Self-Contained, m.d.
12x48" Cincinnati, with spline grinding attach.
12x48" Modern, belted m.d.
12x96" Landis, m.d.
14x18" Cincinnati, m.d.
14x48" Cincinnati Self-Contained, m.d.
14x52" Norton, motorized
16x48" Landis Type D, m.d., latest
20x120" Landis Self-Contained, m.d.
26x96" Landis Self-Contained, m.d.
24x120" Cincinnati Self-Contained, m.d., 1942 machine

UNIVERSAL CYLINDRICAL GRINDERS

No. 1 Brown & Sharpe, m.d., latest
12x24" Cincinnati Self-Contained, m.d., latest mechanical type
No. 2—12x30" Brown & Sharpe, belt
12x30" Landis Hydraulic, m.d., latest
12x36" Cincinnati Self-Contained, m.d.
12x36" Cincinnati, belt
12x48" Cincinnati Hydraulic, m.d., latest
12x48" Cincinati, arranged for spline grinding
12x48" Norton, m.d., latest
16x48" Cincinnati, belted m.d.
18x48" Cincinnati Hydraulic, m.d., latest

PRESSES

Ferracute Double Crank, 36" between uprights, 84 ton cap.
No. 20 V. & O., m.d.
Studebaker 3P No. 205 Hydraulic Arbor, m.d.
Metalwood B3 and B45
Chambersburg 30 ton Hydro-Pneumatic

SHAPERS

48" stroke Heavy duty Morton H.D. Traveling Head Draw-Cut Shaper, m.d., with d.c. variable voltage equipment, 12' bed, latest type
24" Gould & Eberhardt Invincible, m.d.
24" Gould & Eberhardt High Duty, m.d.
24" Potter & Johnson, cone

SHEET METAL MACHINERY

No. 1 Savage Nibbler, m.d., 34" throat
Southwark Rotary Metal Cutter, 36" throat
Gray Turret Head Metal Cutter, cap. ¼", 36" throat
No. 2 Libert Nibbler, 28" throat
120" No. 100 Niagara Heavy Production Folder, 16 ga., m.d.

SLOTTERS

10" Newton, cone
12" Bement-Miles, m.d.
15" Canada, m.d.
20-24" Dill, m.d.
48" Niles-Bement-Pond Geared, m.d.

TAPPERS

No. 1, 2, 1R Bakewell Precision, m.d.
No. 5 Webster & Parks, belt
No. 10 Kaufman High Duty Oscillating Pneumatic, m.d.

MISCELLANEOUS

Bear Precision Balancing, m.d.
Pratt & Whitney "Keller" Machine, model BL-2420, m.d., latest
40" Tolhurst Chip Wringer, m.d.
96" Ohio Extra Heavy Worm Feed Revolving Table, m.d.
Gisholt Precision Balancing Machine, m.d.
Detrick & Harvey 2 spindle Profiler
Morey No. 12M 2 spindle Profiler, latest
No. 20PH A.D. Cook Deepwell Pump with Chrysler Engine and 200' of 8" pipe, brand new
Wagner Saw Sharpener, m.d.

GEAR GRINDERS

9" Pratt & Whitney Hydraulic Spur, m.d.
10" Pratt & Whitney Hydraulic Spur & Helical, m.d.
No. 2HS Lees-Bradner Spur & Helical, m.d.
No. 13LS Fellows Gear Lapper, m.d.

GEAR HOBBING MACHINES

No. 36H Gould & Eberhardt, m.d.
Barber-Colman Model T, m.d., latest
No. 12H Gould & Eberhardt Universal, m.d.
No. 34 Brown & Sharpe, m.d.
No. 44 Brown & Sharpe Spur & Spiral, m.d.
48" Cleveland, m.d.

GEAR CUTTERS

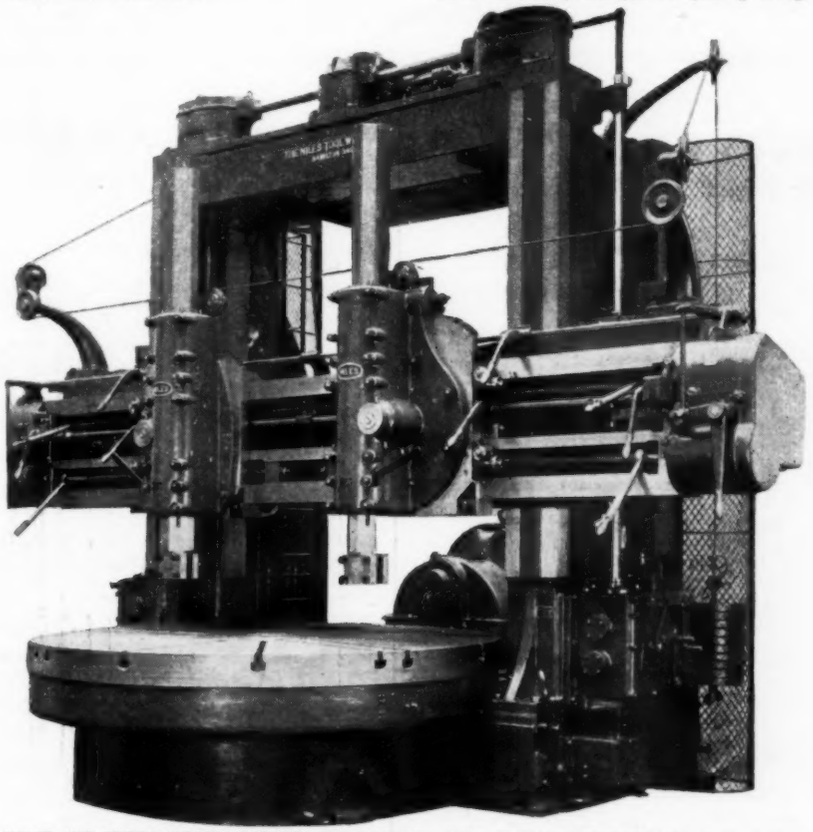
No. 3—26" Brown & Sharpe, m.d.
No. 4—48" Brown & Sharpe, m.d.
3" Gleason Straight Bevel, m.d.
8" Gleason Mfg. Type Straight Bevel, m.d.
11" Gleason Straight Bevel, m.d.
12" Gleason Straight Bevel, m.d.
Gleason Spiral Bevel Gear Rougher, s.p.d.
Cincinnati Gear Burnisher, m.d.
No. 1 Brown & Sharpe Spur Gear Tester
National Groach & Machine Co. Red Ring Gear Speeder, 10" cap.
Cross Gear Rounder, m.d. 9" cap.
Gleason Gear Tester for hypoid gears

CENTERLESS GRINDERS

No. 2 Cincinnati Centerless, m.d., Filmatic Spindle, latest
No. 2 Cincinnati, m.d., older type
Long Bar attachment for No. 3 Centerless
Cincinnati Valve Seat Grinder, cap. ⅜" valve stems, m.d.

CYLINDER GRINDERS

No. 50 Heald Hydraulic, m.d., 11-18" spindle
No. 55 Heald, m.d., 15-24" spindle
No. 73 Heald Airplane Cylinder Grinder, m.d., brand new, latest type



NILES 100" EXTRA HEAVY BORING AND TURNING MILL WITH WESTINGHOUSE 40 H. P. 230 VOLT D.C. MOTOR. MACHINE HAS TWO HEADS ON RAIL AND POWER RAPID TRAVERSE.

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CABLE ADDRESS **EMCO**

Late Type—EVERY MACHINE TESTED AND GUARANTEED AS REPRESENTED—*Immediate Delivery*

LATHES

SOUTH BEND, 10"x3¾', Toolmaker
BRADFORD, 16"x6'.
CLAUSING, 12"x25' M.D.
KENDEY, 16"x6', 16"x8', taper attach.
RIVETT, No. 608 taper attach. precision
BRIDGEFORD, 26"x34"x17', taper attach.
LE BLOND 'REGAL', 13"x5', 17"x6', 17x8'
HARDINGE, 1" cap. second operation
ELGIN & HARDINGE PRECISION, 1" cap.
PRATT & WHITNEY, 10"x20", precision
PRATT & WHITNEY, 13"x6', taper attach.
SIDNEY, 18"x10', taper attach
Monarch Toolroom 16"x30" Model "C"
Monarch Toolroom 18"x54" Model "C"
SEBASTIAN 13"x6' GH M.D.

TURRET LATHES

WARNER & SWASEY #5 Universal, Preselector
MOREY #3 Universal, Bar & chucking (1945)
GISHOLT, #3 bar equip, preselector, #5, #1L
WARNER & SWASEY, #1A chucking
FOSTER, #5 universal, bar feed
SIMMONS MICRO-SPEED, 1¼" cap. bar feed
WARNER & SWASEY #1, ⅝" cap. hand.
BROWN & SHARPE, #0 and #1 Hand Screw
BARDONS & OLIVER #5 Preselector 2" cap.

GRINDERS

BROWN & SHARPE #2 Universal, #13 T.C.
NORTON #2 Universal Hydraulic Tool & Cutter
COVEL, #91A, tool & cutter universal
CINCINNATI, #2 centerless, Filmatic
LANDIS, cylindrical, type H, 4"x12"
HEALD, #72A3, plain internal, HYD.
BLANCHARD, VERTICAL SURFACE, #16, 26"
BLANCHARD, VERTICAL SURFACE, #11, 16"
ABRASIVE, VERTICAL SURFACE, #33, 8x24"
MATTISON, SURFACE, 14"x16"x60", hyd.
BROWN & SHARPE, #5 surface, hyd.
REID, SURFACE, 2B Pope spindle
RIVETT #104—Int.—Ext. Latest
BROWN & SHARPE #2 & #2B Surface
Excello Thread Grinder #31
GALLMEYER & LIVINGSTON 12x24 Hydraulic
Jones & Lamson Thread Grinder, 12"x45"
De-All Hyd. Surface Grinder 6"x18"
Cincinnati Universal Grinder 12"x36", ext.-int.
Wicaco Precision Internal
Cincinnati cylindrical 12x72" centers

SHAPERS

Cincinnati 24" latest heavy duty
Gould & Eberhardt, 16", 20" Industrial
Stockbridge, 16", M.D.
Pratt & Whitney, Vertical 6", M.D.
Atlas on steel bench 7", M.D.
Shaperite floor model 8" NEW

DRILL PRESSES

American 3' Sensitive Radial
American Radial, 4'x11" column
Avey, #2 single spindle, 15" overhang
Leland-Gifford, #2, single spindle
Allen, 6 spindle, #2, 12" overhang
Champion 24", backgeared, #4 taper
Natco, multi-spindle, #D5
Canady-Otto, 17" Roller bearing
Morris MOR-SPEED 3'x9" Univ. table.

PLAIN MILLERS UNIVERSAL

BROWN & SHARPE, #3A, UNIVERSAL
BROWN & SHARPE, #3B, PLAIN
BROWN & SHARPE, #3, UNIVERSAL
CINCINNATI, #2MH, Universal
KEARNEY & TRECKER, #1B, S.P.
BROWN & SHARPE #3 Light Type, Vertical Head
ROWBOTTOM Cam Miller
VAN NORMAN Ram type
22LU UNIVERSAL (1946)
VAN NORMAN #12 duplex Ram type
CINCINNATI #3 plain M.D.
HENDEY universal #2B Vert. attach.

VERTICAL MILLERS

CINCINNATI, #3, #4, dial type
VAN NORMAN, #3V, rapid traverse
KEARNEY & TRECKER, #2KM, dial type
KEARNEY & TRECKER, #3KM, dial type
KEARNEY & TRECKER, #3H, dial type
BRIDGEPORT Turret Miller
PRATT & WHITNEY jig borers #1B, #2

PRODUCTION MILLERS

WALTHAM thread miller, ext. & int.
CINCINNATI, #1-12 automatic
KEARNEY & TRECKER, #1H-18 Mfg. type
SUNSTRAND, #2 Electromill, 24" travel
BROWN & SHARPE, #000, high speed

GEAR MACHINERY

BARBER-COLMAN MODEL #12
FELLOWS #61A, Model—712
GLEASON, 18" cap. straight bevel
GOULD & EBERHARDT, #735, spur gears

AUTOMATIC SCREW MACHINES

BROWN & SHARPE, #0G, ⅝" cap.
BROWN & SHARPE, #2, high speed
BROWN & SHARPE, #2, with slotter
BROWN & SHARPE, #00, high speed ⅜" cap.
ACME GRIDLEY 2" cap. RA6

BOREMATICS AND BORING MILLS

Defiance #25A Horizontal 3⅜" Bar
Bullard, Spiral Drive Vertical Turret 42"
Excello #2112A, double head
Heald #48A, single head
Lucas No. 41, 3" cap. extra long table

PRESSES, SHEARS, BRAKES

Niagara 6'x10 gage, 16" gap
Verson 6'x45 ton cap. press brake
Famco Shears, 36", 52" NEW
Ferracute Press #C3, inclinable
Double Crank Press, 40 ton cap.
Zeh & Hahnemann, 10 ton roll feed
Erie hydraulic 750 ton like new
Diebel Hi-speed and roll feed
Hydraulic Press 25 ton to 750 ton
Bliss Incl. #21 backgeared

MISCELLANEOUS

Riveting Hammers, high speed, #5A
Spot Welders 5 KVA to 100 KVA
Famco Foot Presses, #6, #8, #10, #12, #18
BUTTERFLY Filing machines
Porter Cable belt sanders
Lake Erie Hydraulic Press 750 Ton

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CAPITOL MACHINERY CORPORATION

253 CENTRE STREET NEW YORK 13, N. Y.

MONA MEMBER

ADVERTISED PRICES ON PRACTICALLY NEW MACHINES

(6) CLEVELAND RIGIDTURNERS MODEL No. 618. Original Cost $7,000.00. Excellent Condition. PRICE....$2,000.00 ea.

(1) POTTER & JOHNSTON #5D2 AUTOMATIC CHUCKING MACHINE. Two Spindle, Mfg. in 1942. Excellent Condition. Serial No. 52913. PRICE $4,850.00

(1) #2-L GISHOLT TURRET LATHE, SERIAL NO. 666-17. With Cross Sliding Turret, 3 Jaw Chuck. PRICE.....$4,350.00

(1) #4 GISHOLT RAM TYPE TURRET LATHE. With Bar Feed, Chuck and some tooling. Late Type. PRICE.....$3,250.00

(1) 200 Ton HYDRAULIC STRAIGHTENING PRESS. Mfg. by Hydraulic Press Co., Length of Bed 240", Width 24", Clearance Between Rods 30". PRICE $4,500.00

(1) NO. 33 EXCELLO THREAD GRINDER. Serial No. 4714, Mfg. in 1943. Excellent Condition. PRICE.....$3,000.00

(1) JONES & LAMSON MODEL NO. TG615 AUTOMATIC THREAD GRINDER. Serial No. 130156. Excellent Condition. PRICE $2,750.00

(1) NO. 75-A HEALD INTERNAL GRINDER. Serial No. 22065. Excellent Condition. PRICE $2,250.00

(2) NO. 74 HEALD INTERNAL GRINDERS. Serial Nos. 24602 and 24603. Excellent Condition. PRICE.....$2,250.00 ea.

(1) LANDIS 18 x 18 EXTERNAL GRINDER. Excellent Condition. PRICE $2,500.00

(4) PRATT & WHITNEY 9" GEAR GRINDERS. PRICE.....$1,000.00 ea.

(4) DETROIT GEAR GRINDERS, Model GG-19. PRICE.....$1,150.00 ea.

(1) TURCHAN FOLLOWER FOR BULLARD BORING MILL. PRICE.....$1,000.00

(4) #2-G BROWN & SHARPE Automatic Screw Machines. Excellent Condition. PRICE $4,000.00

(1) ILLINOIS GEAR CHECKER, MODEL #337, Diameter 12", 15" Between Centers. Excellent Condition. PRICE $1,250.00

(1) #3 BARBER-COLMAN GEAR HOBBING MACHINE, Serial #2291. Excellent Condition. PRICE.....$1,750.00

(1) STAMCO PRESS BRAKE, 126" x 12' Gage, Toggle Arm Type. Excellent Condition. PRICE.....$3,500.00

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517-23 SOUTH DELAWARE STREET, INDIANAPOLIS 4, IND.

UNUSUAL VALUES

Milling Machines—No. 1, Universal, No. 1 American (new) plain, No. 1 Vertical.

Drills—Large selection, single and multiple spindles also bench types, many of them new.

Gear Cutters—Brown & Sharpe No. 3—26" Gould & Eberhardt 42".

Grinders—Cylindrical B & S No. 11, Planer type 16"x36", Surface 13"x63", also new (small) Universal bench and floor type. All with coolant, motorized.

Lathes—14"x6', 8', 10—16"x6', 8', 10'—18"6', 8', 10'—26"16'—all cone drive, several motorized also (new) 15"x8' and 10' geared head, motorized
Large stock 19" and 18" bench and floor type.

Planers—Single head 24"x6', 24"x8', 26"x8'.

Shapers—16", 20", 24", B.G. crank.

Turret Lathes—J & L 2"x24"—3'x36" also Acme, W & S Turret (vertical) boring and facing mills, 5 hole turrets, 30", 40".

SPECIAL—New totally enclosed dust proof, fan cooled, ball bearing saw arbor motors, plain shafts to size or threaded, and with collars, measures only 3¼" from center of shaft to flatted top (1 h.p. to 15 h.p.) 2 or 3 phase, 3600 r.p.m.

WOOD WORKING MACHINERY—A very large stock of new and re-built, practically all motorized. New Motorized overhead cut-off and miter saw for wood, plastics, steel, aluminum and other metals. The above list is only a fraction of our stock which changes almost daily, therefore, tell us definitely what you want since we are adding considerable number of machines to our stock which are too many to list. What we have today may be sold tomorrow, so a list is really not dependable.

Drill—Foote-Burt No. 25 24" HI Duty 3" capacity in steel, motor attached.

PATTERN MAKING MACHINERY—42"x16' bed wood lathe, compound rest, rack and pinion feed to carriage; 16" heavy duty jointer, extra long bed, front table tilts for giving draft to pattern work; tilting table also tilting arbor rip and cut-off saws; band saws; jointer; floor and bench type trimmers; and also many other machines for pattern work.

THE OSBORNE & SEXTON MACHINERY CO.

P. O. Box 88, Columbus 16, Ohio

Nos. 0G & 2G B & S High Speed Automatics
No. 2A Warner & Swasey, chucking.
No. 74 Toledo Press

MONA MEMBER

D. E. DONY MACHINERY CO.

47 Laurelton Road, Rochester 9, N.Y.

Bor. Mill, Her. 3" G and L, MD.
Boring Mills, 24"-30"-42"-52"-72"-90"
Drills, Radial 3'-4'-5'-6' Cin.-Bick.
Lathe, Turret 3-A W and S, S.P.D.
Millers, Plain No. 3 K and T, No. 4 Cin.
Millers, Vertical No. 3 B and S and No. 4 Cin.
Shaper, 16"-20"-24"-36".
Shaper, 36" Morton Draw Cut.
Squaring Shear, Niagara 11'x10 gauge

West Penn Machinery Company

1210 House Bldg. Pittsburgh, Pa.

LATEST TYPE NEARLY NEW MACHINES

AUTOMATIC SCREW MACHINES

BILLINGS & SPENCER #B2 Di-matic Cut Off.
BROWN & SHARPE #4, 1⅛" capacity, Latest Type
BROWN & SHARPE #2G High Speed, Latest Type
CONOMATIC 2⅝", 6 spindle, Latest Type
GOSS & DeLEEUW 8" Automatic Chucker, 5 spindles
NATIONAL ACME 9/16, 5 spindle, Model D, M.D.

BORING MILLS—Horizontal

CINCINNATI GILBERT 3½" bar, floor type, latest
DETRICK & HARVEY 4" bar, Floor Type, M.D.
FRANKLIN 4¼" Bar Table Type—M.D.
GIDDINGS & LEWIS #25, 2½" bar, M.D.
HEALD, #48A, #49 single, double end Borers, latest
LANDIS—#35—3½" bar, #40—4" bar, floor type, M.D.
LUCAS #41, 3" bar, Latest Type
NILES BEMENT POND 5", 6", bar, floor type
UNIVERSAL 3" bar, high speed, latest type
UNIVERSAL No. 3A, 3" bar M.D.

BORING MILLS—Vertical

BETTS 120", 2 swivel heads, AC, M.D.
BULLARD 16", 6 and 8 spdle., Type D, Multi-au-Matics, Latest Type
BULLARD 36" Vert. Turret, Motor Drive
KING 52", 62", 2 swivel heads, PRT, M.D.
NILES 84", 2 swivel hds., P.R.T., M.D.
NILES 100", 2 swivel heads, DC., M.D.
NILES 38-44" Vert. Turret, Motor Drive

BROACHES

CINCINNATI 1-30 Duplex, Vertical, Surface, Double Ram, Model ER, Hyd., Latest
CINCINNATI 3-30 Duplex, Vertical, Surface, Double Ram, Model ER, Hyd., Latest

DRILLS

AVEY MA-8, 2 spdles., Latest Type
AVEY MA-6 3 spdles., Latest Type
BAKER 30 Single Spdle., Motor Drive
BARNES H-3 Hydram, Hyd., Latest Type
EDLUND 1B, 2B, 2MS, Latest Type
FOOTE BURT #2, #3, M.D.
HIGH SPEED HAMMER R-53, Latest
LELAND & GIFFORD #2, #2MS, Single Spdle.
SNYDER 10V-18 Vert., Hyd., Latest

DRILLS—Deep Hole

BARNES 420/2 Spindle Hydraulic, Latest Type
BAUSH #1½x30 2 Spindle, Latest Type
Le BLOND #2 Single Spindle, Hydraulic, Latest Type
PRATT & WHITNEY ½Bx30, ½Bx50 2 Spindle, Latest Type

DRILLS—Multiple Spindle

FOOTE BURT 20 spindles, Hyd., Latest
BOLEY 10 spdles, High Speed, Latest
KINGSBURY Model GC, Latest
PRATT & WHITNEY #12, 8 spdles., M.D.

DRILLS—Radial

AMERICAN 5' arm 13" column, Plain M.D.
CIN. BICKFORD 6' arm 15" col. Plain or Univ. M.D.
DRESES 4' arm, 13" column Plain, M.D.
DRESES 5' ram, 15" column, Univ., M.D.
FOSDICK 5' arm, 14" column, Plain, M.D.
NILES 6' arm, 15" column, Univ., M.D.
WESTERN 6' arm, 20" column, Plain, Latest Type

GEAR CUTTING EQUIPMENT

BARBER COLMAN Type S Hobber, Latest Type
BROWN & SHARPE No. 3H Gear Cutter, M.D.
FELLOWS Model Z Gear Shaper, High Speed, Latest
FELLOWS #615 A, #61, #7A, #72, #7, #725, #75, 61A, #77 High Speed Gear Shapers; Latest Type
FELLOWS #12M Involute Measuring Instrument, latest
FELLOWS #6Z2 Gear Shaper; high speed; latest type
FELLOWS #13LS Lapper, Latest Type
GLEASON 3", 12", straight bevel generator, latest type
GLEASON 10", 15", Spiral Bevel Generator, M.D.
GLEASON 11", 18" Straight Bevel Generator, M.D.
GLEASON #20 Spur Gear Tester, Latest Type
GLEASON #4, #6, #13, #18 Bevel and Hypoid Tester
GOULD & EBERHARDT #36H Hobber, M.D.
GOULD & EBERHARDT 12HS Hobber, Latest Type
GOULD & EBERHARDT 12H Hobber, Latest Type
KOEPFER Model WMII Automatic Hobber—Latest
PRATT & WHITNEY 10" Grinder, Hyd., Latest

GRINDERS—Cyl.—Plain & Univ.

BROWN & SHARPE #1, 2, 3, Universal, Latest
BROWN & SHARPE, #5 Plain, 3 x 12, Latest Type
BROWN & SHARPE #20 10x18 Plain, Latest Type
CINCINNATI 6"x18" Plain, Model EA, Hyd., Latest
CINCINNATI 16 x 36" Plain "Filmatic", Latest
LANDIS 4 x 12, 4 x 18, Type H Plain Hyd., Latest
NORTON 10" x 36" Type C, Plain, Hyd., Latest
NORTON 6"x18" Type C, Plain, Hyd., Latest

GRINDERS—Miscellaneous

BRYANT #5, #16-16, #16-CP-16, #24, Internal Hydraulic, Latest Type
CINCINNATI #3 Centerless, Motor Drive
CINCINNATI #2 Centerless, "Filmatic," Latest
CINCINNATI Centerless Lapper, Model ED, Latest
COVEL #22 Universal Tool & Cutter, Latest Type
COVEL #91A Univ. Cutter and Tool, Latest
EXCELLO #46C Carbide, Latest
FITCHBURG 14" x 25" Spline, Hydraulic, Latest
GLEASON #12 Tool Sharpener, Latest Type
HEALD 50, 70 Internal, Motor Drive
HEALD, 75A, 72A3, 72A5, 74, 81, 70A Internal; Latest
HEALD #72A3, 72A5 Internal "Gagematic", Latest
JONES & LAMSON 6x15, 8x48, Auto. Thread, Latest
LANDIS 5" Oscillating, External, M.D.
PRATT & WHITNEY Contour, Latest
THOMPSON 6" x 48" Auto., Round Broach, M.D.

GRINDERS—Surface

BLANCHARD #16, 24" Chuck, Motor Drive
BLANCHARD No. 16A—Dial Type—Motor Drive
BLANCHARD #11, 16", Latest Type
BROWN & SHARPE #2, 6"x18", M.D.
DO-ALL Model G 10, 8"x24", Hyd., Latest Type
DO-ALL Model G-7, 9"x20", Hyl., Latest Type
HEALD #22 Rotary, 12" Chuck, Latest Type
HEALD 25A—Rotary—16" and 30" Chuck, Hyd., Latest
KENT 6" x 18" Hand, Latest
MATTISON 14x24x72" Hyd., Latest
MATTISON 14x16x60" Hyd., Latest
NORTON 6x18 Hydraulic; Latest Type
PRATT & WHITNEY 8" Rotary, M.D.
THOMPSON 12"x24" Hyd., Latest Type

JIG BORERS

PRATT & WHITNEY 1A, Motor Drive
REED-PRENTICE #5 Die Sinker, Latest Type
VERNON, Precision, Latest Type

LATHES—Engine and Mfg.

AMERICAN 18 x 72" Centers, Geared, M.D.
AMERICAN 36" x 360" Centers, 2 Carriages, M.D.
BRIDGEFORD 36" x 32' Bed—2 Carriages, M.D.
HENDEY 12 x 54" Centers, M.D.
JONES & LAMSON "Fay" 20 x 25" Automatic, Latest
KEIGHLEY LIFTS 8/16 x 26" Centers Gap, Latest
LeBLOND 20" x 40" Centers, Geared, Motor Drive
LeBLOND 25 x 96" Centers, Geared, M.D.
LEHMAN 16 x 30" Centers, TIMKEN, Latest Type
LODGE & SHIPLEY 14"x30", 16"x30" Centers Latest
LODGE & SHIPLEY 18 x 72 Centers, M.D.
LOSWING 4x60, 4x48, 8x60, 8x108, 5x34, Latest
MONARCH 18" x 48" Centers, Timken, Latest
MONARCH 12 x 30" Centers; Timken; Latest Type
MONARCH 12" x 54" Centers, Timken, Latest Type
MONARCH 16 x 28" Centers, Geared-Head, M.D.
MONARCH 10"x20" Centers, Model EE, Timken, Latest
MONARCH 22"x456" Centers, 3 Carriages, Timken, M.D.
MONARCH 24 x 54 Centers, Geared, Motor Drive
MOREY Model A 8" x 120" Shaft Turner, Latest Type
NILES 26" x 48" Centers, D.C., M.D.
NILES 26" x 72" Centers, D.C., M.D.
NILES 30" x 100" Centers, D.C., M.D.
NILES 42" x 60" Double Head, Motor Drive
NILES 72"x62' Centers Comb., Boring & Turn., M.D.
NILES 30 x 50' Boring, Timken, Latest Type
NILES 48x87' Centers, Comb. Boring and Turn., M.D.
NILES 90"x110" Centers, Standard Driving Wheel, M.D.
PRATT & WHITNEY 16"x60" Centers, Geared, M.D.
PRATT & WHITNEY 16" x 30" Centers, Latest
PRATT & WHITNEY 10" x 20" Centers Bench, Latest
PUTNAM 42" x 25' Centers, Motor Drive
REED PRENTICE 16x24" Centers, Geared, M.D.
REED PRENTICE 26" x 54" Centers, Latest
SCHUMACHER & BOYE 24"x158" Centers, Geared M.D.
SPRINGFIELD 14" x 6' Bed, Geared Head, M.D.
SPRINGFIELD 16" x 6' Bed, Geared Head, M.D.
SPRINGFIELD 16" x 30" Centers Timken, Latest Type
WARD, HAGGAS & SMITH—18/30 x 60" Centers Gap Motor Drive, Latest Type

LATHES—Turret

BARDONS & OLIVER #5, #7, TIMKEN, Latest Type
CINCINNATI ACME No. 1 Timken, Latest
FOSTER #4FU "Fastermatic," TIMKEN, Latest
GISHOLT #1L, #2L, Universal, Timken, Latest
GISHOLT #3, #4, Univ., TIMKEN, Latest Type
JONES & LAMSON #3, #5, #8A Univ. Timken, Lat.
LIBBY No. 1H-5 Timken Bearing—latest—3½" Hole
MOREY No. 2G, No. 3, No. 4, Timken Bearing, Latest
POTTER & JOHNSTON 5D, 5D2E, Auto., Timken, Latest
WARNER & SWASEY 5, Universal, Timken Bearing
WARNER & SWASEY #3A Universal Motor Drive
WARNER & SWASEY #1A, Univ., Timken; Latest
WARNER & SWASEY #2A Universal, Timken, Bar & Chucking, Latest Type

MILLING MACHINES—Mfg.

CINCINNATI 24", duplex, TIMKEN, M.D.
HALL Style D, Planetary, Latest Type
INGERSOLL 42"x38"x12' adj. rail, 4 heads, A.C., M.D.
INGERSOLL 32x24x16' Planer Type, 2 heads, AC, M.D.
INGERSOLL 32x30x12' Adj. Rail Slab, M.D.
SUNDSTRAND Model 3A Duplex, Latest Type
TAYLOR & FENN M80 Duplex Spline, Latest

MILLING MACHINES—Plain

BRIGGS Type A, Hyd., 12" & 18" Feed, Latest
BROWN & SHARPE #12, 24" Feed, Latest
BROWN & SHARPE #2, Light, Timken, Latest
BROWN & SHARPE 2B, 3B, Timken, Latest
CINCINNATI 0-8 Automatic Rise and Fall, Latest
CINCINNATI 1-12, 2-18 Auto. Latest Type
CINCINNATI #4 TIMKEN, Motor Drive
CINCINNATI 3, 4, 5, Motor Drive
CINCINNATI 24" Automatic, TIMKEN, M.D.
CINCINNATI 4-36 Hydromatic, Latest Type
KEARNEY & TRECKER 1218, TIMKEN, Latest
KEARNEY & TRECKER #3, 4, Heavy, Timken, M.D.
KEMPSMITH #4 Maximiller, Timken, Latest Type
LeBLOND No. 4, Belted Motor Drive
SUNDSTRAND #3, Rigidmill, Timken, M.D.

MILLING MACHINES—Vertical

BROWN & SHARPE #5, M.D.
CINCINNATI #2, #3, #4 Dial Type, Timken, Latest
CINCINNATI #08, TIMKEN, Latest Type
COCHRANE & BLY #14, M.D.
GORTON 9J Hand Feed, Latest Type
KEARNEY & TRECKER 2H, Timken, Latest
MOREY 12M Profiler, Latest Type
PRATT & WHITNEY 12B Profiler, Latest Type
REED PRENTICE #5 Die Sinker, Latest Type
REED PRENTICE 3VG, with or without Hydraulic Duplicator, Timken Bearing, Latest Type
SUNDSTRAND #3 Profile & Channel, Latest

MILLING MACHINES—Universal

AMES 2½"x19" Table, Latest Type
CINCINNATI #4, High Power, M.D.
HARDINGE Model UM, Timken, Latest
KEARNEY & TRECKER #2 Heavy, Timken, M.D.
KEMPSMITH #4 Maxi-miller, Timken, Latest
VAN NORMAN #12, Timken, Latest Type
VAN NORMAN #3, Duplex, M.D.

PLANERS

CHANDLER 36"x36"x20'—4 Heads, AC, M.D.
CLEVELAND 48"x60"x20'—Openside, 3 Heads, M.D.
DETRICK & HARVEY 48"x48"x16'—4 Heads, Hyd.
GRAY 24"x24"x8' A.C. Motor Drive
GRAY 36"x36"x8'—2 Heads, Max. Service, D.C. Variable Speed, Motor Drive
LIBERTY 24"x24"x8'—Vari-Voltage, Latest Type
NILES 54"x54"x18'—4 Heads, Box Table, M.D.
NILES 48"x48"x16'—3 Heads, Box Table, M.D.
WHITCOMB BLAISDELL 24"x24"x72", Motor Drive
WOODWARD & POWELL 54"x54"x20', 4 Hds., M.D.

PRESSES

BIRDSBORO 325 Ton, Vert. Hyd., Latest Type
CHAMBERSBURG 50 Ton, Vert. Hydro-pneumatic
CHAMBERSBURG 200 Ton, Horiz. Straightening, M.D.
CLEARING Type DS-1125-32 Dbl. Action 125 Ton, Latest Type
CLEARING H-50-36 Vertical Hydraulic, Latest Type
FERRACUTE #DG-55, 75 Ton Drawing, Latest Type
GLEASON 15 Ton Quenching, M.D.
HANNIFIN 15 Ton Moulding, Latest Type
HPM 37-Ton Vertical Hydraulic, Latest Type
LAKE ERIE 500 ton Vert., Hyd., Latest
LUCAS 30 Ton Forcing, Latest
NILES 200 ton Wheel, Motor Drive
WATSON & STILLMAN 20 Ton Hyd. Straightening.

SHAPERS & SLOTTERS

CINCINNATI 24" Crank, M.D.
DILL 20"-24" Vertical, Motor Drive
GOULD & EBERHARDT 16" High Duty, M.D.
GOULD & EBERHARDT 32" INVINCIBLE, M.D.
GOULD & EBERHARDT 16-20" Shaper
LAMAIRE 18" Vert. Hydraulic, Latest Type
LYND FARQUHAR 26" Openside, M.D.
NEWTON 15" Vert. Slotter, DC, M.D.
ORMEROD 8" Vertical, Latest Type
PRATT & WHITNEY 6", Vertical, M.D.
SMITH & MILLS 16" High Speed, Latest Type

MISCELLANEOUS

AJAX 1½", 2", 3½" Forging and Upsetting, M.D.
BAKEWELL #1, #1R Tapper, M.D.
BARNES #172, 306H, 307 Vertical Hone, Hydraulic, Self-Oiling, Latest Type
BILLINGS & SPENCER 1500 lb. Board Drop Hammers
CAMPBELL #401 Abrasive Saw, Latest Type
CLEVELAND 12"x16' Centers—Cutter Reliever, M.D.
FOSTER 4x18 Super Finisher, Hydraulic, Latest
GROB O-8 20 Band Saw, and Filer, Latest
HANSON & WHITNEY 4"x9" Thread, Miller, Latest
LANDIS 2" Bolt Threader, Motor Drive
MICHIGAN 1708A Cutter Reliever, Latest Type
MOREY 12x30", 120", 190" Thread, Miller, Latest
NAZEL #4B Pneumatic Hammer, M.D.
NORTON #2F 10U Vertical Lapper—Latest Type
PELLOW #2 Nut Slotter, Latest Type
PORTER CABLE Type AG-8 Sander, Latest Type
PRATT & WHITNEY (KELLER) Type BL-2416 Copying, Latest Type, 2 & 3 Dimensional
PRATT & WHITNEY (KELLER) Type G Copying, Latest Type 2 Dimensional
PRATT & WHITNEY ½Bx50 Rifler, Latest Type

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TURRET LATHES
(All Late Type)

Warner & Swasey #4 and #5 Pre-Selector Head Universal—holes thru spindles 2-7/16"x 2⅞"—swing 18⅛" and 20"—considerable Tooling.

4—Bardons & Oliver #3 Universal—swing 15⅜"—hole spdl. 1⅞"—Two (2) 3 HP to 1,015 RPM—Two (2) 5 HP to 1,525 RPM—bar feed.

Gisholt #3L Turret Lathe—hole thru spdl. 5¼" —swing 28½"—bar equip.

Jones & Lamson #5 Ram Type Univ.—hole spdl. 3"—swing 21¼"—spdl. speeds 20 to 1,000 RPM.

Cin-Acme #6 Universal—hole spdl. 3"—swing 20¼" —spdl. spds. 30 to 600 RPM.

Foster #3 Univ. Ram Type—hole spdl. 2⅜"—swing 17½"—bar feed.

Brown & Sharpe #1 Hand Feed Screw Machine (late type).

3—Potter & Johnston #6DRE Timken Bearing Automatic Chucking Machines—multi V-belt MD—swing 34"—Turret feed 16"—hole thru spdl. 2⅜"—spdl. spds. 20 Range 9 to 167 RPM —considerable Tooling.

ENGINE LATHES

Pratt & Whitney 16"x36" and 20"x48" model "B" Geared Head motor-in-base holes thru spdls. 1-11/16" and 2"—8 spdl. speeds.

Lodge & Shipley 20"x8' MD 12 speed Grd. Head —swings 23"—ctrs. 48".

Porter-McLeod 24"x12' QCG MD—swing 25"—centers 85"—spdl. hole 1¾"—Taper atchmt.

Hendey 14"x6' and 14"x8' EBM—Taper atchmt—collets.

American 24"x8' 8-speed GH—multi V-belt MD—swing 24½"—ctrs 46"

Bridgeford 36"x56', 15 speed GH MD—swing 38" —centers 48 feet—mtzd apron—taper atchmt.

Norton 10"x18" Type "C" mechanical Traverse cylindrical Grinder (1942 mchc.)—wheelhead, Table and workhead multi V-belt MD lever type footstock—complete with coolant.

MILLING MACHINES—*Late Type*

B & S #2 Light Type Vertical-power rapid Traverse

Milwaukee #2K Vertical—1500 RPM

Van Norman #230 Universal (like new)

PLANERS

Whitcomb 60"x36"x14"—Two hds.

Cincinnati 78"x56"x22'—4 heads.

Putnam 84"x84"x40'—4 heads.

SHAPERS

Gould & Eberhardt 16", 20"x24" MD crank shaper

Hendey 32" Timken Bearing MD crank Shaper.

Write, wire or phone (Worcester 6-5175) for complete listing.
This is only a partial list of outstanding values.

Botwinik Brothers of Mass., Inc.
3 SHERMAN ST. • WORCESTER 1, MASS.

Roller Type Scaling Machine 22" Slab Capacity
#1A W&S Turrt Lathes Bar Feeds
Libby 26" Turret Lathe, 4½" Hollow Spindle
#33 ExCello Ext. Thread Grinders
Norton Ext. Plain Grinder 24"x36"
Landis #3 Universal Cyl Grinder 16"x48"
Lees Bradner CT 36" Thread Millers
B&S #4, 36" Gear Cutters
Fellows 615 Gear Shaper
Farnham Forming Roll 12'
Onsrud Router Model A-4-RR 84"
#2B—4 sp. Edlund Drill 16"x52" Table
#2 Cincinnati Milling Machine, Plain
#3 LeBlond Plain Milling Machine

CONTINENTAL SALVAGE & MACHINERY CORPORATION
1838 EUCLID AVENUE, CLEVELAND 15, OHIO
MAIN 4402

National Bent Shank Nut Tappers Battery of ⅝" to 1" Machines.

Waterbury-Farrel Fdry. ⅝" and 1" D.S. S.D. Cold Headers, also Thread Rollers.

Fisher 5" Bar, Floor Type Boring Mill. New in 1942.

Niles, Bement, Pond 60"x60"x24' table 4-Head Planer, Rev. D.C. M.D.

Bliss Presses in all sizes up to 1,000 ton capacity.

Wire Working Machinery.

National Machinery Exchange
128-138 Mott St., New York 13, N.Y.

BROACHES

Twin Ten Oilgear hydraulic.
No. 3XA Oilgear hydraulic.
No. 3 Lapointe screw type.
No. 1 Foote Burt duplex surf.
9 ton American surface.
40 ton, No. V48 American vert.

GEAR MACHINERY

No. 3 Barber Colman.
No. 12 Barber Colman, PRT.
No. 6 Fellows gear shaper.
No. 130 Cleveland sql. spdl. Rigidhobber.
No. 8H G. & E. univ. hobber.
No. 12H G. & E. Univ. hobbers.
16 HS Gould & Eberhardt Type B spur gear hobber.
8"-10" No. 1 Lees Bradner Production hobber.
14" Nos. 5A & 5AC Lees Bradner hobbers.
24"x12" Flather automatic spur.
Cimatool Peerless chamferer.
National Tool Co. involute gear and gear-cutter checker, Model B.
2 spdle. Lipe gear tooth rounder.
10" Pratt and Whitney hyd. gear grinder. 2 wheel model.
18" Gleason bevel gear testers.
18" Gleason bevel gear lappers.
18" Gleason combination testing & lapping.
Red Ring gear lappers.
No. 20 Gleason spur gear tester.
Model HRS Barber Colman hob grinder.

GRINDERS, INTERNAL

No. 72A5 Heald hydraulic with cross sliding head.
No. 72A5 Heald plain with extended bridge.
No. 72A3 Heald plain with cross sliding head.
No. 72A3 plain with facing attmt.
No. 72A3 Heald Sizematic centerless.
No. 72A3 Heald Sizematic int.
No. 72 Heald Sizematic int.
No. 75 Heald Internal.
No. 75A Heald internal, cross feeding headstock.
Size IG Grenby internal gdr.
Majestic internal grinder.
No. 42 Van Norman radius.
No. 16 A16 Bryant, intl and facing.
No. 16 CP16 Bryant.
No. 16-28 Bryant.
No. 16-36 Bryant.
No. 24-36 Bryant.
MH1 Sav-way hydraulic feed.

SEPARATORS, OIL

No. 900 DeLaval separator or oil purifier.
No. 40 Tolhurst 7½ bushel oil or chip.
No. 1200E Barrett oil or chip.
No. 502E Barrett bushel oil or chip.

SHAPERS

6" Pratt & Whitney vertical.
16" Gemco.
16", 24" & 28" Gould & Eberhardt.
20" & 24" Gemco universal, New.
24" Columbia universal.

SHEET METAL TOOLS

Nos. 1 & 2M Pettingell hammers.
No. K90M Yoder double hammer.
No. 10 Magee wiring mach.
No. F24 Yoder double seamer.
Quickwork universal machine.
No. 202½ V. & O. trimmer and threader.
12" No. 2 Campbell nibbler.
72"x14 ga. Wysong & Miles squaring shears, New.
36"x18 ga. Pexto squaring shear.

SLOTTERS

16" Bement Miles slotter.
6" Pratt & Whitney.

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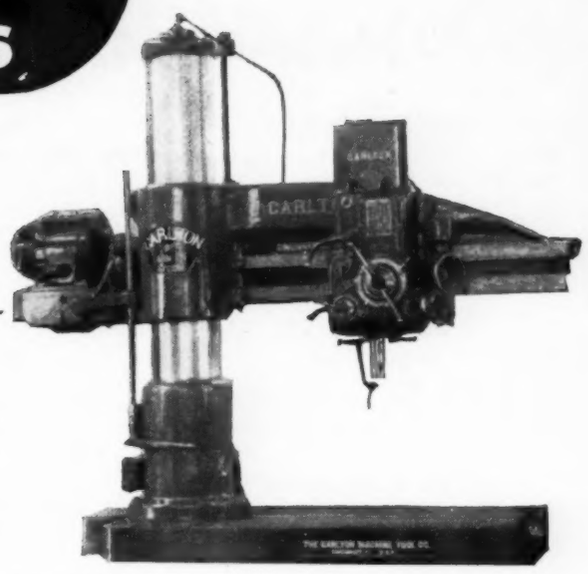
SAGINAW, MICH.

MODERN
used and rebuilt
MACHINE TOOLS



6′ 17″ CARLTON RADIAL DRILL, with motor on arm, enclosed head, 96 spindle speeds (10 to 1250 RPM), 18 feeds (.004″ to .125″) #6 morse taper, electric clamping device, box table, DC motors and controls. New 1942.

PARTIAL LIST OF MACHINES NOW IN STOCK

AUTOMATICS
Bullard Mult-Au-Matic, 6 spdl. Model D. 1941.
6″ Conomatic, 4 spindle. 1943.
6″ Goss & DeLeeuw Chucker, 8 spdl. 1943.
2½″ Cleveland, Model A. 1944.
1¾″ Greenlee, 6 spindle. 1942.
9/16″ & 1″ RA 6 Acme Gridley. 1943.

BORING MACHINES
No. 40 Universal "Triway", 4″ bar. Late.
No. 49 Heald "Bore-Matic." 1942.
No. 47A Heald "Bore-Matic." 1942.
No. 2112A Excello. 1943.

DRILLS, RADIAL
4′ 11″ Carlton. 1943.
3′ 9″ Cincinnati Bickford. 1943.
3′ 9″ Dresses. Late.

DRILLS, UPRIGHT
No. 36 HO Baker. 1942.
No. H3 Barnes Vert. Hydram. 1942.
25″ Fosdick Economax. 1941.
24″ Sibley Sliding Head. 1942.
No. 3 Bausch Multiple Spindle.
Fox Multiple Spindle. 1944.
Barnes 2 Spindle Deep Hole. 1943.

DRILLS, SENSITIVE
No. KH2 Allen, 6 Spindle. 1943.
No. 2 MS Allen, 1 to 3 spindle. 1942.
No. 2 Motor-Avey, 3 spindle. 1942.
No. 2B-8 Edlund, single spindle. 1942.
No. 2 Hamilton-Muehlmot. 1943.
Leland-Gifford, single spindle. 1942.

GEAR CUTTERS
No. 5 AC Lees Bradner Gear Gen. 1941.
No. 7A & 715 Fellows Gear Shaper. 1942.
Model 615A Fellows Gear Shaper. 1944.
Model GCL-3 Red Ring Gear Shaver. 1942.
Type S Barber Colman Hobber. 1942.

GRINDERS, CYLINDRICAL
14″ x 36″ Norton Type C Universal. 1943.
10″ x 48″ Norton Type C Plain. 1941.
10″ x 36″ Landis Type C Plain. 1944.
10″ x 24″ Landis Type C Universal. 1942.
10″ x 18″ Norton Type C Plain. 1942.
6″ x 18″ Landis Type C Plain. 1941.
4″ x 12″ Landis Type H Plain. 1942.
No. 2 & 3 Cincinnati Centerless. 1942.

GRINDERS, INTERNAL
No. 74 Heald Extended Bridge. 1941.
No. 75A Heald, two motor. 1943.
No. 72A3 Heald Plain. 1942.
No. 72A5 Heald Plain. 1944.
No. 16 CP-16″ Bryant. 1942.
No. 104 Rivett. 1942.

GRINDERS, SURFACE
16″ x 16″ x 48″ Thompson, Type C. 1943.
12″ x 12″ x 40″ Thompson, Type B. 1942.
No. 3B Abrasive. 1942.
No. 2B Reid. 1944.
No. 25A Heald Rotary. 1942.
No. 22 Heald Rotary. 1943.

GRINDERS, TOOL & CUTTER
No. 2 Cincinnati Univ. 1941.
No. 22 Covel Universal. 1942.
No. 4T Sellers Carbide Tool. Late.
Barber Colman Combination. 1943.
No. 44, 48 and 49 Excello. 1942.

LATHES, ENGINE
20″ x 48″ Lodge & Shipley. 1941.
18″ x 54″ Lodge & Shipley. 1943.
18″ x 54″ Sidney. 1943.
18″ x 48″ Bradford. 1942.
16″ x 8′ South Bend c.d. 1944.
14″ x 78″ Reed Prentice. 1942.
14″ x 54″ Reed Prentice. 1942.
14″ x 30″ Hendey. 1939.
14″ x 30″ Lodge & Shipley. 1943.

LATHES, PRODUCTION
14″ x 42″ Monarch "Magna-Matic." 1941.
9″ x 20″ Lipe. 1942.
8″ x 36″ Lo-Swing Semi-Auto. 1942.
8″ x 21″ Fay Automatic. 1942.
8″ x 15″ Sundstrand, Model 8. 1942.
Model 1MP & R Lo-Swing.

LATHES, TURRET
No. 3A Warner & Swasey. 1943.
No. 2A Warner & Swasey. 1942.
No. 9A Jones & Lamson. 1942.
No. 1 Acme Universal. 1941.
No. 3L Gisholt. Late.
No. 2L Gisholt.
No. 5 Warner & Swasey. 1941.
No. 4 Warner & Swasey. 1941.
No. 3 Warner & Swasey. 1943.
No. 2 Warner & Swasey. 1941.
No. 2, 3 & 7 Bardons & Oliver. 1941.
No. 3 & 4 Gisholt. 1943.

MILLING MACHINES, PRODUCTION
No. 34-36 Cincinnati "Hydromatic." 1942.
No. 3-36 Cincinnati "Hydromatic." 1943.
No. M-24 Milwaukee "Simplex." 1942.
No. 1248 Milwaukee "Simplex." 1942.
No. 08 Cincinnati, Rise & Fall. 1942.
No. 2-18 Cincinnati, Rise & Fall. 1942.
No. 1-18 Cincinnati. 1942.
No. 12 Brown & Sharpe. 1942.
No. 1-14 Kent Owens. 1943.
No. MM-1-6 U.S. Multi-Miller. 1942.
No. 00 & 2 Sundstrand. 1943.

MILLING MACHINES, PLAIN
No. 3B Brown & Sharpe. 1941.
No. 3 Kempsmith-Maxmiller.
No. 2H Milwaukee. Late.
No. 2M Cincinnati.
No. 2B Brown & Sharpe.
No. 1 Brown & Sharpe.
Van Norman Hand Mill.

MILLING MACHINES, UNIVERSAL
No. 2A Brown & Sharpe. Late.
No. 2M Cincinnati.
No. 2MH Cincinnati. 1942.
No. 2H Milwaukee. 1942.

MILLING MACHINES, VERTICAL
No. 2 Milwaukee, Model D. 1945.
No. 3H Milwaukee. 1940.
No. 2K Milwaukee. 1942.
No. 2 Cincinnati. 1940.
No. 2 Milwaukee.
No. 40-H Index.

MISCELLANEOUS
No. CPC 6-30 LaPointe Vert. Broach. 1941.
50KVA Federal Spot Welder. 1942.
No. 616 Cleveland Rigidturner.
No. 26F Norton "Hydrolap." 1942.
No. 74 Excello Center Lapping Mach. 1942.
No. 1 Savage Nibbling Machine.
5 HP Clark Buffer.
100 Ton Hannepin Hydraulic Press. 1942.
No. 45 Reliance Punch Press. 1945.
No. 8-6 Zeh & Hannemann Punch Press. 1942.
No. 14½ Williams & White Single End Punch.
No. 3C Hendley & Whittemore Punch & Shear.
Type D Langlier Swaging Machine. 1941.
3′ Leland Gifford Radial Tapper. 1941.
No. 1 Savage Roller Type Nibbler. New.
No. GS24 Parker Tube Bender.

PLANERS & SHAPERS
52″ x 36″ x 40′ Cincinnati Planer.
42″ x 42″ x 20′ Cincinnati Planer.
36″ x 36″ x 16′ Ohio Planer.
28″ Smith & Mills Shaper.
16″ Gould & Eberhardt Shaper.
6″ Pratt & Whitney Vertical Shaper.

SAWS
14″ x 20″ Racine "Shear Cut." 1942.
13″ x 13″ Peerless Universal. 1943.
11″ x 11″ Peerless "Hydra Cut." 1945.

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LATE TYPE MACHINE TOOLS

New—1941-1945

BORING MILLS

No. 22 Defiance Table Type Horizontal
No. 25B Defiance Table Type Horizontal
No. 40 Landis Floor Type
5" Ohio Floor Type
New 6" Simmons Hor. Floor Type
24", 36" and 42" Bullard Spiral Drive

BOREMATICS

No. 48A Heald Single End
No. 49 Heald Single End
No. 49 Heald Universal Single End
No. 215A Excello Senior Double End

GEAR MACHINERY

3" Gleason Straight Bevel Gear Generator
12" Gleason Straight Bevel Gear Generator
15" Gleason Spiral Bevel Cutter Sharpener
15" Gleason Quenching Press
No. 13 Gleason Universal Gear Tester

GRINDERS

No. 70A Heald Internal
No. 72A3 Heald Sizmatic Internal
No. 72A3 Heald Plain Internal
6"x18" Cincinnati Plain Hydraulic
No. 30A Brown & Sharpe Plain
14"x48" Cincinnati Plain
14" Pratt & Whitney Vertical Surface
16"x16"x48" Thompson Model C Hydraulic Surface
No. 1 and No. 2 Brown & Sharpe Universal
No. 7 Grand Rapids Hydraulic Universal and Tool
No. 13 Brown & Sharpe Universal and Tool
6"x15" Jones & Lamson Model TG615 External Thread
12"x5" Jones & Lamson Model TG125 Internal Thread

NUT AND BOLT EQUIPMENT

No. 250C Manville SSSD Header
No. 33 Waterbury Farrel DSOD Header
No. 500C Manville Hand Feed Thread Roller

LATHES

27"x48" LeBlond Heavy Duty Geared Head
25"x120" LeBlond Geared Head
42"x86" American Geared Head
42"x108" Niles Heavy Duty Geared Head

PRODUCTION MILLING MACHINES

No. 2-18 Cincinnati Plain Auto.
No. 4-36 Cincinnati Hydromatic Plain
18" Cincinnati Duplex
No. 1854 Kearney & Trecker Simplex

PLAIN MILLING MACHINES

No. 2SP and No. 3SP Van Norman
No. 26 Van Norman Ram Type
No. 3 Cincinnati Dial Type Medium Speed
No. 4K Kearney & Trecker
No. 5H Kearney & Trecker
No. 5HM Kearney & Trecker

UNIVERSAL MILLING MACHINES

No. 3 Kempsmith
No. 3SU Van Norman

VERTICAL MILLING MACHINES

No. 08 Cincinnati
No. 2 Cincinnati Dial Type Medium Speed
No. 2 Standard Brown & Sharpe
No. 3 Cincinnati Dial Type Medium Speed
No. 4H Kearney & Trecker
No. 4K Kearney & Trecker

MISCELLANEOUS MILLERS

4½"x12" Model C Pratt & Whitney Thread Miller
84"x75"x20' Ingersoll Adjustable Rail Miller

PLANERS

42"x42"x18' Gray
48"x48"x26' Niles Bement Pond

SCREW MACHINES

1"x5" Model 60 New Britain Gridley Six Spdl.
8½"x8" Goss & DeLeeuw Auto. Chucking

TURRET LATHES

No. 5U Foster Universal Geared Head
No. 1 Warner & Swasey Plain Head
No. 2 Warner & Swasey Universal Geared Hd.
No. 3 & No. 4 Warner & Swasey Univ. Grd. Hd.
No. 1A Warner & Swasey Universal Grd. Hd.
No. 3 Bardons & Oliver Universal Geared Hd.
No. 1L Gisholt Universal Geared Head
No. 7A—2½"x96" J. & L. Univ. Grd. Hd.

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16" x 54" LeBLOND Heavy Duty Lathe, Taper attachment
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No. 3 WARNER & SWASEY Turret Lathe
No. 3B BROWN & SHARPE Dial Type Plain Milling Machine
No. 4 CINCINNATI Plain Mill, Dial Type
No. 1224 KEARNEY & TRECKER Simplex
36" OHIO Extra Heavy Duty Shaper
No. 615A FELLOWS Gear Shaper
20"/24" GOULD & EBERHARDT Industrial Universal Shaper
6" x 18" CINCINNATI Cyl. Grinder
12" GLEASON Bevel Gear Generator

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BORING MILL, Hor. #0 G & L, 3" bar.
BORING MILL, Vert. 14' Niles, 2 Hds., M.D.
BORING MILL, 42" King, 2 Hds., M.D.
BORING MILL, 72" N-B-P, 2 hds., M.D.
BROACH, XA Oilgear, Hor., 60" Str.
DRILL, Radial 4½' Cincinnati-Bickford.
DRILL, Radial 5' Cincinnati-Bickford.
DRILL, Radial 8' American, Mtr. on Arm.
GEAR HOBBERS, 12-H Gould & Eberhardt
GRINDER, Brosch, "E" Thompson, 6x48" Hyd.
GRINDER, Int., No. 72-A-5 Heald. Hydraulic.
GRINDERS, Surf. Nos. 3 & 5 Abrasives.
GRINDER, Surf. Rotary No. 25 Heald.
HAMMER, Pneumatic, Nos. 4-B & 6-B Nazel.
HAMMER, Steam Drop, 2000# Chambersburg.
HAMMER, St. Forging, 6000# Chambersburg
LATHE, 9"x5' Hardinge, Prec., M.D.
LATHE, 14"x6' Hendey, Tie-Bar, T.A., M.D.
LATHE, 14"x6' L. & S. 12-Speed Grd. Hd.
LATHE, 22"x16' L. & S. Q.C.G., T.A.
MILLERS, Pl. No. 3, 4, & 5 Cincinnati.
MILLER, Plain No. 4B K & T, Vert. Att.
MILLER, Thread, No. 40 Lees-Bradner.
MILLER, Duplex, 24" Cincinnati.
MILLER, Univ., No. 4 Cincinnati.
PLANER, 30"x30"x8' Liberty, M.D.
PRESS, S.S., 250 Ton Chambersburg, Hyd.
SHAPERS, 24" and 32", M.D.
SHAPER PLANERS, Openside, 26" Farquhar.
SHEARS, 12' x 18 ga., 11' x 1½".
SHEAR, Sq. No. 372 Stoll, 72"x⅛".
UPSETTER, 4" National, M.D.

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BROACH, Colonial 10-36" Vertical Surface
DRILL, 5' American Triple Purpose Radial
DRILL, No. 14 Natco Multiple, M.D.
GEAR HOBBERS, No. 12-H and 24-H G & E
GEAR SHAPER, #48 Fellows, 72" Int. Gears
GRINDERS, No. 16 Blanchard, 30" chuck
MILLING MACHINE, No. 56-90 Cincinnati Plain Hydromatic, Tracer Control
MILLING MACHINE, No. 1-18 Cincinnati
MILLING MACHINE, No. 4 Cincinnati Universal, Timken Brg., Rect. Overarm
PRESS, No. 3A Bliss D C, Tie Rod, S G
PRESS, No. 1B Superspeed, 10 ton, HS
SHAPERS, 16" G & E High Duty, M.D.
TAPPER, No. 1 Bakewell
THREAD GRINDER, No. TG-615 Jones and Lamson, 1943 machine
THREAD MILL, 6" x 48" Pratt & Whitney

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Reed Prentice 10D6 6 oz. Inj. Moulder
Kling 10'x½" Bending Rolls
B & S 006 Automatics (3)
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Canedy-Otte 3'9" col. Radial
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Universal 3" boring mill
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Gorton 3U, 3L, 3Z, ME, Engravers
Gorton Cutter Grinders
6A Auto. Hacksaw
Marvel No. 6A Auto-Hacksaw
Landis #6 Thread Grinder
Hanson-Whitney Thread Miller
Thompson 6 x 18" Hyd. Surf. Grinder, Type C & F, Atlantic
Abrasive 6 x 18, 8 x 24 Surface Grinders No. 3B, 34, 1½
Consomatic 1⅞" 8 spindle
Brown & Sharpe #5 Cyl. Grinder
Tannewitz Band Saw #36M
Thompson Selsky Seam, Spot Welder
Mod. 26 Rafter, New 1945
W & S Nos. 3, 4 Grd. Hd. Pre-selecter
Gisholt No. 4, 5, Univ. Turrets
Acme #6W M.D., Foster 3B
Oliver 20' Woodworking Planer
Oster 601 Rapiduction, Tooling
Hardinge ESM, 2nd operation
Cincinnati 12x36" Univ. Grinder
No. 18, 25 and 35 Gallmeyer and Livingston Hyd. Surface Grinders, 6x18, 8x24
#25A Heald, M.D., Rotary Surf.
Cinn. #2 Centerless Grinders Filmatic (2)
B & S No. 2, 2B Surface, M.D.
Norton 6x18" Hyd. Surface, M.D.
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Hammond & Excello Carbide Grind
Gardner #226 Disc Grinder
Monarch 10"x20" Lathe, Mod. EE
Hendey 12x30, G. H. Lathes
Mercy No. 3 Univ. Turret Lathe
South Bend, M.D. 9x3½", 10x48" 13"x5'
Sebastian 12x4' grd. hd., Sheldon
Rivett No. 918 bench, M.D.
Hardinge, Elgin Cabinet Lathe
Lodge & Shipley 16"x78" 12 speed
Buffalo #0 Angle Roll, Excelsior
Bliss #58, OB Gap Presses 62, 62A, 162
Burke Miller Pl. & Univ.
Nichols Hand Miller, Vert. Hd.
Delta Single & Multiple Drills
Oliver Heavy die Filer, 510 Drill Pointer, Sellers 4G
Taylor Winfield 50 KVA Spot Welder
Peerless No. 226, Eyeletting
HI Speed Hammers, all sizes
Cinn. #3 Pl., #4 Vert. Dial Type Rect. Arm, Mills
B. & S. #12 Elec. Prod. #000
Waterbury-Farrell #30 Thread Roller & Dies, 1943
V & O 102 Reducing Press
V & O, Z & H 25, 35 Ton OBI
Cinn. 1-12, 2-18 Production Mills
Stokes Tablet Presses
Ball & Jewel Plastic Grinders
20"x30' Boye & Emmes Grd. Hd., Lathe
Onsrud Router W240
Micromatic Hydrohener HI
Walker-Turner Bench Drills, ½"
Porter-Cable G8 Belt Sander
Wilder Optical Comparator
Black Diamond Drill Grinder
Cinn. & Schauer Speed Lathes
Cleveland #1 Vertical Miller
Clark Hardness Tester
Bakewell #1, Ultromat Tappers
Federal #5 OBI Press
Gen. Flexible Elec. Screw Press
Davis #4 Keyseater
Chicago (D.&K.) 334 Brake
Clearing 90 10 Press Brake
Excelsior 21", Buffalo 18" Drills
Kent Owens IV Prod. Mills
Pratt & Whitney Radius Grinders
B&S #1 Hand Screw
Van Norman Prod. Mill
Diamond #31 O.B.I. Pres, Like New
Toledo 400 ton Knuckle Joint Press
Bliss #4, 5½ Styles Presses
Baker No. 2 Keyseater

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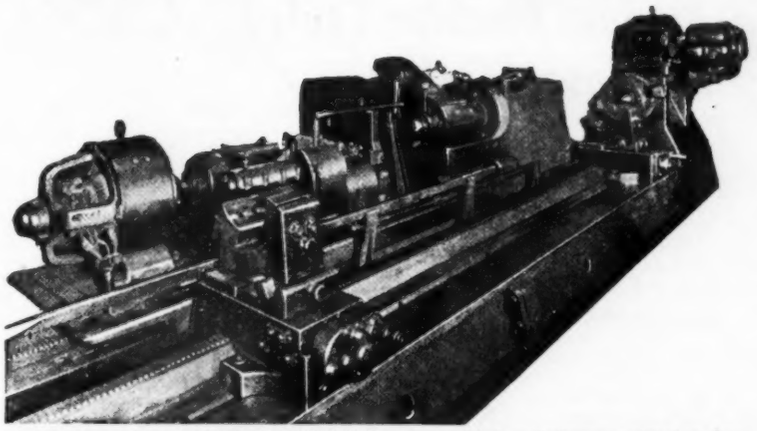
VALUES IN MODERN TOOLS



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Spot & Arc Welders, 6x8" Racine Hacksaw
4, 5, 7, 10, 12, 18, & 30 ton OBI Power Presses
Ammco 7", Shape Rite 8", Shapers
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Drill Presses, Foot Presses, Air Hydraulics
Kalamazoo Metal Band Saws
No. 1½ Abrasive Wet Surface Grinder
20 ton Northern Hydraulic Presses
10Z & 20Z Injection Moulders
Famco 6C Arbor Presses—½ Price—Presses
Sheldon 12" B.G. Shaper

TURRET LATHES

Foster Nos. 4, 5, 6, 1B, 3B, M.D. Univ.
J. & L. 2"x24", 3"x36", W & S #4, 2A

GRINDERS

Surface Grinders, 6x18, 8x24, Abrasive, G. & L.
P. & W. 14", B.B., Vert. Surface 19"x48"
Blanchard 30", M.D.; Modern 12x48" M.D.
Norton Hydraulic 12x18", M.D. Cyl.
Heald No. 72A3 Gagematic
Norton 50"x28' M.D. Roll Grinder
Landis Type A 6x20" Hydraulic, M.D. Cyl.
No. 55, 60, 65 Heald Int., M.D.
12" Heald Rotary, Arter 12" M.D.
B. & S. No. 10, 11, Cyl.: 1, 3 Univ.

LATHES

26x12' Boye & Emmes 3 step cone D.B.G.
14"x6' Hendey Taper, Collets 16"x8'
9" LeBlond, P&W 1"x15" Automatic
36x30' Putnam M.D., 36x22', 42x16
32"x35' Wickes, M.D.
Wade, Hjerth, Hardinge, P & W Precision Bench

AUTOMATICS

Cone 4 spindle, Gridley
Brown & Sharpe #4, 6 Auto., #2 Hand Screw

MISCELLANEOUS

Buffalo 25UD Comb. Punch-Shear
Pexto 3' to 8' Shears & Brakes
Gorton 1A: 375-2 Tool & Cutter Grinders
Wiedman Turret Punch—Type R4P
9" Vertical Shaper, P & W
10x10 Peerless Universal Shaping Saw
#7, 72 Fellows Gear Shapers

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500 TON LAKE ERIE PRESS

Platen 35"x36", 36" stroke, 68" opening, 150 H.P., 220-440 V. Motor.
600 Ton Baldwin South. Platens 76"x59, Stroke 22", Opening 36".
500 Ton H.P.M. Double Action with 160 ton cushion. Platen 36"x36", Stroke 24", Opening 36".
375 Ton ELMES Double Action, with 60 ton cushion. Platen 84"x44", 12" Stroke, 42" Opening.

350 TON VERSON PRESS

40x40 Platen, 36" stroke, 72" opening. 100 H.P. 3 phase—60 cycle 440 volt.

400 & 500 TON SHAFT STRAIGHTENERS, Self Contained

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Deskel G1, G2, G1F Engraving machine
Leland-Gifford 1, 2 & 4 spindles, Model M8
Geo Ohl 8' 16 Gage M.D. Shear, 12' 10 Ga. Brake
Oster No. 316B 6" Pipe Threader, M.D.
Bliss 30" Gang Slitter, 19, 20, 21 OBI Presses

MILLING MACHINES

3B K. & T. Dbl. Overarm
Cleveland Vert. No. 1 M.D.; #1 Univ.
#2B K. & T. Univ.; No. 2, 2A B & S Univ.
No. 3S Cincinnati, S.P.D. rapid trav.
Nos 1½, 2, 5 B & S Plain & Univ.
Hall Planetary Model D Thread Miller
Becker Nos. 3, AB, 5, 6 Vert.
Nos. 2, 3, 4 Cincinnati Vert., S.P.D.
P. & W. No. 12, 1 & 2 spind. Profiler
B & S. No. 1, 3 Vert., Kempsmith No. 1, 3
Taylor-Fenn Spline Miller

RADIALS

Carlton 3' Arm 19" col. M.D., 3½' Mueller
4', 5', 6' American Triple Purpose
Walker-Turner ½" cap., Cinn. Blek. 6'

BORING MILLS

#0 Giddings & Lewis arr. M.D. 3"
2½" Cleveland arr. M.D., 2½". 4" Bissee
Niles-Bement-Pond 4- duplex, 66" Niles
Bullard New Era 24", 42", King 42"

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Avey & Allen 3, 4, 5, & 6 Spindles
Fox M.D. Type 138C Multi Spdl. Late
Cincinnati-Bickford 3', 4', 5' & 6' Radials
Niles-Bement & Pond 6' Radial

GRINDERS

Norton 6"x10"x36" Surface
Norton 15"x17"x72" Surface
Hill-Acme 18"x96"x24" Surface
B. & S. Nos. 1, 2, 3, 4 Universal
Brown & Sharpe M.D. No. 5 Plain
Bryant Nos. 3B, 6 & 12 Internal
Norton No. 2 Cutter & Tool, M.D.
Cincinnati No. 2 & No. 3 Centerless
Cincinnati No. 3 Centerless Lapper
B. & S. No. 13 Univ. & Tool, Late Type
Blanchard No. 16—26" & 16A
Blanchard No. 16—30 Vert. Late
Heald No. 22—12", 16" Rotary Surface
Abrasive Nos. 33, 3 & 34 Surface
Heald Nos. 70A & 72A Internal
P. & W. 14" Vert. B. B., M.D.
Norton Type "C" 6"x18" M.D. Hyd. Cyl.
Norton 10"x24" M.D. Plain Cyl.
Pratt & Whitney 9" M.D. Hyd. Gear
Reid 2B M.D. Auto. Surface

LATHES

Johnson 36"x36' B.G.L.C.G. Engine
Monarch 12"x30" CK (swings 18")
Hendey Plain 12", 14", 16", 18" Yoke Head
Hendey 12"x5' Y. H. Fact. M.D.
Hendey 24"x8' M.D. Q.C.G. Eng.
Hendey 12"x5' M.D. Geared Head
Amer. 18"x12' B.G. M.D. Engine
American 30"x16' G.H. M.D. Q.C.G. Eng.

MILLERS

LeBlond 3 GH Plain Heavy
Pratt & Whitney Keller Type
BL-2416 Semi-Auto. Duplicator
Cin. No. 2 Univ.
K. & T. No. 2HL, No. 4H Plain
Milw. No. 3B Univ. D.O.
B. & S. No. 3A Universal
Cin. Nos. 2 & 3 Vert.
Van Norman No. 3SP Plain
Becker Model C Vertical
B. & S. Nos. 3B Plain
Van Norman Nos. 0, 10 & 11 Duplex
P. & W. 8", 10" & 12" Auto.
Cincinnati 18" & 24" Production
P. & W. 6"x80" M.D. Thread
P. & W. 6"x14" Int. Thread
Cinn. No. 3 M.D. Plain
Milw. No. 1H-12 Mfg.
Potter & Johnston 2M Horiz. Auto.
Gorton No. 9J Vert. Late
B. & S. No. 21 Plain Auto.
Kempsmith No. 2G Plain Late
Kempsmith No. 4, Plain Max. Late

SHAPERS

Cincinnati 24" M.D. Crank Late
Hendey 32" M.D. Crank Late
Gould & Eberhardt 24" Crank
Gould & Eberhardt 16" M.D. Crank

PRESSES

W. F. No. 6 Knuckle Joint Coining
Bliss No. 304 M.D. S.S. Single Crank
Bliss No. 703 M.D. Flat Edge Trimming
Bliss No. 21 O.B.I. Power
W. F. No. 7 O.B.I. Dial Feed

SCREW MACHINES

B. & S. Nos. 00, 0, 2 Automatic
B. & S. Nos. 1 & 2 Hand
Gridley 7/8", 1¼", 1¾" & 2⅝" Model G
Cone 1¼", 3¼", 3½" & 4¾"—4 Spindle
Simmons No. 2 Micro-Speed
Foster No. 7 & 7B
W. & S. Nos. 1, 2, 2A, 3A Univ.

373 WELTON ST., NEW HAVEN 9, CONN.
EXPORT DEP'T: 44 G WHITEHALL ST., NEW YORK

Botwinik Brothers
INCORPORATED

BENNETT SPECIALS

36" Bullard Mill, Spiral Dr., 4 jaw
4" bar Universal Table Type Mill, 60" spin. to table, 96" spin. to outer support, '42.
3½" & 4" Landis Floor Type Mills
3" bar Yoder, Table Type Hor. Mill, 30" spin. to tble., 72" spin. to outer support, 1942.
10"x48" Cinci. Grinder Plain, Late
96" Cincinnati Vert. Boring Mill, P.R.T.
42" King Vert. Mill, side head, 1942
48" x 20' centers Simmons Lathe, 1942
48" x 20' centers N.B.P. Lathe, Grd. Hd.
42" x 96" centers Amer. Lathe, Grd. Hd., M.D.
48" x ⅛" Roller Leveller, 11—4" rolls
10' x 3/16" Niagara Shear, 20" gap.
36" x 32' bed Niles Lathe, 2 carr., T.A.
16"/18½" x 54" cc Springfield Lathe, 1944
7' Carlton 17" col. Radial, 1943
Nos. 5, 4, 3 & 2 W. & S. Turrets, Late
#4 Gisholt Univ. Turret Lathe, 1942
36" x 36" x 12' Cinci. Hypro Planer, 4 Hds., Var. Voltage, 1943
24" x 24" x 16' Ingersoll Planer Type Miller, 4 hds., 20 H.P. AC, M.D.
4K K. & T. Miller, Hor. Dial
48" N.B.P. Slotter, Grd., Late
15' x ¾" Wicks, Bending Rolls, M.D.

BENNETT MACHINERY CO.
30 Church St., New York 7, N. Y.

PRESSES

375 ton Elmes, 12" stroke, 84x54 bed, late type
350 ton Elmes, 20" stroke, 36x45 bed, late type
250 & 750 Baldwin, 144x48 bed, 40" stroke
#408A Bliss Dbl. Action Toggle, 72x54 Bed. w/cushions, mtrs., controls.
#305 Bliss, 8" stroke, late, w/air cushions.
60 ton, Dbl. Crank, 5" stroke, 48x24 bed, late model Waterbury Farrel (3).
2300 ton Bliss Hydr., 3 col. type, 12" str., 42'
#56 Toledo 4" stroke, 21x21 bed, 15½" shut height.
35 ton, 4, 5, 6" stroke, latest type, pract. new, w/all accessories, Bliss $850.00 ea.
70-85 ton 4" stroke, 21x27 bed, 110 strokes per min., Bliss, latest type.
90-125 ton 4½" or 5" stroke, 60, 80, 110 (optional) strokes per min., late Type.
Inclinable, new, 20 to 70 ton, immed. dely.

AUTOMATICS, LATEST TYPE

#0G B & S, late type
1" New Brit. Grd., 6 spdl
1⅜" R4—New Brit. Grid.
1½" & 1⅝" Cone—8 spdl. late
9/16", 1", 1¼", 1⅝", 2", RA6 Acme Grid.
2¼" & 2⅝" Cone 6 Spdl.
16" 8 spdl. Bullard Multaumatics, pract. new, (3) with some tooling, dbl. & sgl. index
12" 8 spdl. Bullards, late type, lots of tooling.

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36"x32' Niles Bement Pond Lathe, 2 carriages
25"x16' LeBlond G.H. Lathe
13"x30" Model "B" P&W Tool Room Lathes
#2 and #3 Warner & Swasey Turret Lathes
#12 and #22 Brown & Sharpe Production Millers

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1—300 Ton Caldwell Horizontal Wheel Press

1—Niles Bement Pond Wheel Lathe. Will turn up to 42" Wheels.

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FOR HOME, SHOP AND FARM USE

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These pumps are brand new. Original acquisition cost approx. $100.00. Can also be used as hydraulic motor; for rams, opening doors, hydraulic lifts, etc.—also for any liquid transporting job. War surplus, but brand new. Ship. wgt. 7 lbs. Send check or money order. Satisfaction guaranteed. Postpaid in U.S.A. Each only **$9.95**

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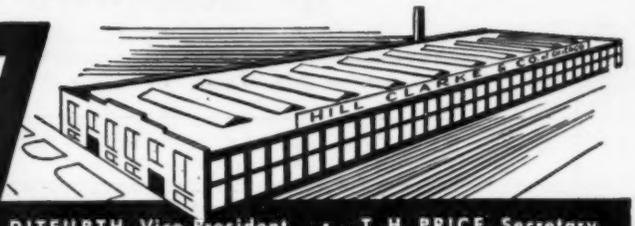

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Each machine is tested under power. Chief Tester, Louis Hoffman has been with Hill-Clarke 31 years.

AUTOMATICS

No. 2 Brown and Sharpe
1⅝" Greenlee, 6 Spdls (1941)
No. 61 New Britain 6 Spdls. 2¼" (1942)
No. 6 Brown & Sharpes

DRILLS

No. D-8 Colburn No. 6 Morse Taper
No. 150 Baker Mfg.
No. 1LMS—20"—6 Spdl. L.G.
No. 2LMS—26"—1 Spdl. L.G.
No. 2LMS—26"—4 Spdl. L.G. (1942)
No. 2MA6—15"—4 Spdl. Avey
No. 2LMS—26"—6 Spdl. L.G.
No. 3B—24"—6 Spdl. Edlund (1942)
No. 2—8 Spdl. Leland-Gifford
No. 4 BL Natco 36 Spdls.
7'-15" Col. American Full Universal

GEAR MACHINES

No. 7125 Fellows (1943)
No. 712 Fellows Auto Indexing (1943)
No. 72 Fellows Gear Shaper
No. 18-H Gould & Eberhardt
11" Gleason Bevel Gear Cutter
12" Gleason Bevel Gear Cutter
72" Cincinnati Gear Cutter
No. 13 Gleason Univ. Tester (1942)

HOR. BOR. MILLS

No. 26 Defiance, 4½" bar (1943)
No. 31 Lucas, 3" bar
No. 3A Universal, 3" bar
Rockford, 3⅛" bar

GRINDERS

4"x12" Landis, Model H (1942)
4"x18" Landis Model H (1942)
6"x18" Norton Type C Plain (1943)
6"x30" Norton Type C Plain (1943)
10"x18" Norton Type C Plain (1943)
10"-14"x36" Norton Type C Plain (1942)
Norton Motor Driven Plain Grinders
6"x18" —— to —— 24"x240"

12"x36" Landis Type LCH Universal (1945)

No. 5—8"x24" Covel Hydr. Surf. (1941)
24"x24"x84" Mattison Hydr. Surf.
No. 34 Abrasive Surface (1943)
No. 22—12" Heald Rotary Surface
No. 25A—24" Heald Rotary Surface (1943)

72A-3 Heald Internal Grinder (1942)
72A-5 Heald Internal Grinder (1942)
74 Heald Internal Gdr. (1942)
No. 5 Bryant Internal Grinder (1942)
No. 16-16 Bryant Internal Gdr. (1942)
No. 16-38 Bryant Internal Grinder (1942)
No. 24-26 Bryant Internal Grinder (1942)

10"x72" Colonial Broach Grinder

LATHES

14"x6' Hendey, Yoke Head
15"x5' Sebastian, Grd. Head
16"x54" centers LeBlond (1941)
18"x6' American, Grd. Head
36"x30' Lodge & Shipley
36'—48"x16' Lehman Hydrotrol (1945)
48"x20' centers Simmons (1942)
50"x17' centers LeBlond (1942)

LATHES (Production)

8"x15" Sundstrand, Model D (1943)
10"x22" Sundstrand, Model AA (1943)
12"x18" Lipe Carbo (1942)
16"x33" Fay Automatic (1942)
20"x25" Fay Automatics (1942)

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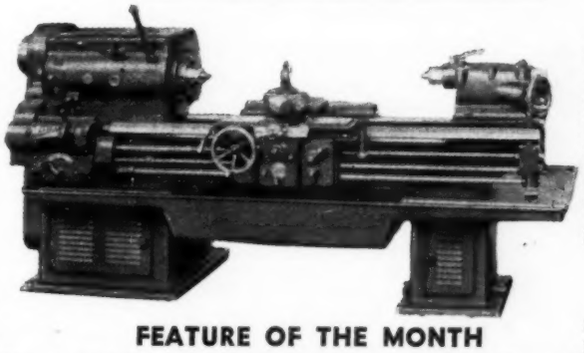

FEATURE OF THE MONTH

16—18½"x54" between centers. LeBlond Heavy Duty Geared Head Lathe. Motor in Base. Late Model. Ready for immediate shipment.

MILLING MACHINES

No. 4 Cincinnati Plain (1943)
No. 08 Cincinnati Vert. (1942)
No. 2H Milwaukee Vert. (1942)
No. 2 Cincinnati Vert. (1942)
No. 2M Cincinnati Vert. (1941)
24" Cincinnati Production
No. 1-18 Cinn. Mfg. (1940)
No. 2—18" Sundstrand Electromil (1942)
No. M-18 Milwaukee Simplex (1942)
No. M-24 Milwaukee Simplex (1942)
38"x40"x10' Fitchburg Duplex Miller (1943)
No. 4-48 Cinn. Hyd. Tracer (1942)
No. 45-48 Cinn. Hyd. Plain Tracer (1942)
No. 56-90 Cinn. Hydromatic (1943)
No. 2 Hanson-Whitney Thread
4"x9" Hanson-Whitney Univ. Thrd. Miller
4½"x12" Pratt & Whitney, Model C
6"x20" Pratt & Whitney, Model C
6"x36" Lees-Bradner—Model HT (1943)
6"x48" Pratt & Whitney Thrd. Miller
6"x80" Pratt & Whitney Thread
6"x132" Pratt & Whitney Thread Miller
6"x168" Pratt & Whitney Thread
10"x48" Hanson-Whitney Thread Miller (1942)
4" Taylor & Fenn Spline, M.D.
24"x24"x12' Ingersoll Adj. Rail
36"x36"x16' Ingersoll Slab Miller
No. 10 Ingersoll 72"x6' Traveling Col. Face Millers (1942)

MISCELLANEOUS

18" Dill Slotter
Model H-7 Micromatic Hydro Honer
Model H-705 Micromatic Hydro Honer
Model H-2 Micromatic Hydro Honer
Model 200 Micromatic Hydro Honer
No. 22-C Racine Shear Cut Hack Saw
8-M Wells Band Saw
No. 20 Bliss O.B.I. Press
No. 2 V & O open back press
No. 0 Bakewell Tapper
Baush Radial Tapper (1942)

PLANERS

36"x36"x12' Cincinnati
36"x36"x18' Gray, 4 Heads
48"x36"x14' Gray
48"x48"x12' Cincinnati, 4 Heads

TURRET LATHES

No. 2 B. & S. Screw Machine, Wire Feed
No. 3 Bardons & Oliver (1942)
No. 5 Warner & Swaseys (1942)
No. 5 Bardons & Olivers (1942)
No. 5 Foster, A.C. & Bar Feed (1942)
No. 2-A Warner & Swasey
No. 1-H Libby, 6¼ Hole in Spindle (1937)
No. 1-H Libby, Extra Long Bed (1942)
18" Libby, 3½" Hole in Spindle
No. 4A Warner & Swasey, 7½" Hole in Spindle

VERT. BOR. MILLS

34" King
36" Rogers, side hd. (1942)
72" Cincinnati
72" Niles Extra Heavy
84" Betts

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ROLLS, BENDING, Cleveland #2A, 10'x½", Pyramid Type, Drop End, 20 H.P.

IRONWORKER—Pels #16 Universal. Punch 1-1/16" thru 5/8". Shear 4x4x½ Angles. Squares 1-5/16". Rounds 1½".

PLANER—Niles Bement Pond. Working Bed 48"x48"x26' with 4 Heads. 15 H.P. D.C. 230 volt. Variable Speeds.

PLANER, Cleveland, Openside, 36"x36"x12' Working Table, 2 Heads on rail, 1 side head, Motor, controls.

HYDROHONER—Micromatic Model #H4 (1943) Cap. 2" diam. x 6" Length.

GEAR TESTER—Gleason Model #20 (1943) Cap. testing gears—up to 24" diam. Like New.

ROTARY GRINDER—Blanchard, Cap. 25", Magnetic Chuck, belt drive, old machine, good condition, Bargain.....$750.00

LATHE—ENGINE—Bridgeford Geared Head, Q.C., 32"x21' centers, Motor 35 H.P., Serial 32,870.

DROP HAMMER—Cecostamp (Chambersburg) 1943. Air operated. Stroke 48". Bed 66"x48"; Capacity 16,000 lbs. Wt. 47 Ton.

UPSETTER—Horiz. Forging, Ajax #2½, Motor 15 H.P., Wt. 15 Ton, approx.

SQ. SHEAR—10'x3/8" cap. With 15" Gap. 15 H.P. Wt. 20 Ton.

WIRE STRANDER (1943)
2 Robinson 6"x7 spool, reel, motor. 7½ H.P.

SAW—NEWTON COLD CUT—Late. 32" diam. Blade, 10" diam. capacity Q. C. Variable Speeds. 2 Motors A.C. Wt. 5 Ton.

AUTOMATIC THREAD GRINDER—J. & L. (1943) Model TG-1245, Cap. 12"x45"—5 Motors.

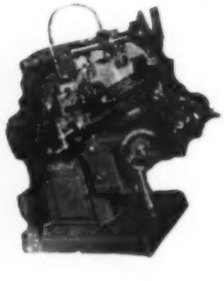
POWER PRESSES

PRESSES	TONS	STROKE	BED-FB, LR	TYPE
Perkins #500B	50	3"	20" x27"	O.B.I. b.g.
(2) Bliss #58	20	5"	12½"x13½"	C Frame (1943)
(4) Ferracute C22	20	5½"	13½"x14"	Duplex, 2 Presses on 1 stand (1943) Hopper Feed
(3) L. & J. #3	22	2½"	12½"x21½"	O.B.I. (1945) Air Safety
Torrington	50	2" & 1"	23" x16"	Sub Arch, Dble. Action, Cam
Toledo #54	60	3"	18" x18"	SS with side shear
(2) Bliss #305	100	12"	24" x24"	SS, b.g. (1942)
(2) Bliss #6	125	2" & 5"	24" x32"	SS Dble or Single Action, b.g. (1942)
Bliss #407	180	27" & 17"	45" x54"	Toggle, Will draw 12½"
Clearing (F1200-42	200	30"	38" x44"	SS Single Action b.g. (1942)
Bliss #7-72	200	10"	39" x74"	SS Dble Crank, SA, Cushion
Baldwin Southwalk	250	40"	60" x144"	Hydr. SS—4 Post
(3) Bliss #78½ (#310)	450	18"	52" x36"	SS Single Action b.g.
Baldwin Southwalk	500	48"	52" x52"	Hydraulic, 4 Column
Birdsboro	1300	21"	29" x87"	Hydraulic, (1942)
Toledo #185	1400	26" & 18"	72" x72"	Toggle, Will Draw 13"
Cecostamp	16,000 lbs	48"	66" x48"	Air Drop Hammer for die stamping (1943)
Bliss #410B Toggle	450	25" & 17"	60" x96"	Toggle, Draw 11½"

MDNA MEMBER

KINGS COUNTY MACHINERY EXCHANGE
408 Atlantic Ave., Brooklyn 17, N. Y. Phones: TRiangle 5-5237, 5-5212, 5-5213

NOW Is The Time To Buy Late Type Machine Tools



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OTHER FINE MACHINE TOOLS IN STOCK

14" x 60" Pratt & Whitney Hydr. Vert. Surface Grinder, 1942.
36" Rogers "Perfect 36" Vertical Turret Lathe, 1942.
36"x36"x12' Pond Planer, 2 Heads, M.D.
3" Universal Horiz. Boring Mill, just rebuilt
72" N-B-P Vert. Boring Mill.
60" Cincinnati Vert. Boring Mill.
48"x30' N-B-P Lathe, M.D.
12" Oster-Williams Pipe Machine.
4' American "Hole Wizard" Radial Drill, '42.
20" Smith & Mills Univ. Shaper, Power Down Feed '42.
2—#2G B&S High Speed Automatics.
16"x54" c.c. Lodge & Shipley lathe.
16"x33" Fay Auto. Lathe, '42.
#2H Kearney & Trecker Vert. Mill, '42.
#4 Cincinnati Plain Mill, Rect. Arm.
3—#2M Cincinnati Plain Millers, Timken, mtr. in base.
3—#000 B&S Production Mills, '42.
12"x36" Norton "C" Univ. Cyl. Grinder, '41.
14"x40" B&S #3 Univ. Cyl. Grinder, '42.
6"x30" Norton "C" Plain Cyl. Grinder, '42.
7" Peerless Hydracut H.S. Power Hack Saw, 1942.

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1—1⅜" 6 spindle Greenlee Automatic Screw Machine
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2—Norton Type 26F Hyprolaps
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Froude Water Dynamometer
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1200 H.P. @ 1200 R.P.M.

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BUILT MACHINE TOOLS

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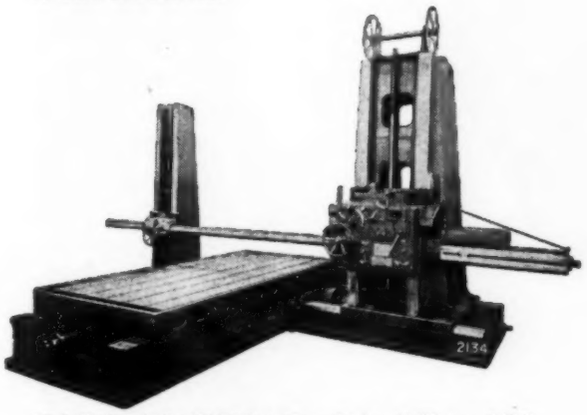
24" & 36" New Era Bullard
36"-44" Niles Vertical Turret
42" & 52" King, 2-Heads
48" & 54" Colburn, 2-Heads
60" & 72" Niles, 2-Heads
61" Bullard Maxi Mill
84" Niles, 2-Heads
10' & 12' Niles, 2-Heads
10' Betts with side head

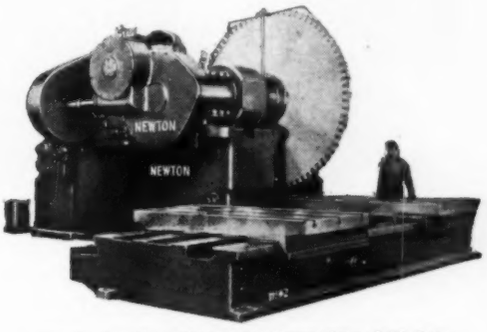
56" x 30" x 20' Consolidated Heavy Guide Planer, with two adjustable housings, 4-rail heads.

LATHES

16" & 18" American, G.H.
20" & 24" American, G.H.
30" x 10' American, G.H.
36" x 20' Lodge & Shipley
36" x 24' Niles Timesaver
42" x 18' American, G.H.
42" x 32' American, G.H.
48" x 18' American, G.H.
50" x 50" Pittsburgh, G.H.
60" x 28' Niles, G.H.



6" & 3½" Spindle JONES Late Type Boring, Drilling and Milling Machine. Planer table 7' 6" x 17'. Max. Table to 6" Spindle 8' 6", Approx. Weight 160,000#.



120" Newton Type "U" 97-A Heavy Duty Cold Saw with Hydraulic Screw Feed.

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POSITIONS WANTED

(Continued from page 264)

PRODUCTION EXECUTIVE: Metal stampings; screw machine products; castings. High speed progressive die, and deep drawn stampings. Parts assembly. Lacquered; painted, and plated finishes. Unusual ability to handle labor. PW-6615 American Machinist.

TOOL ENGINEER familiar with design of dies, jigs, and fixtures, cutting tools, and broaches. PW-6860, American Machinist.

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SALES ENGINEER well acquainted industrials North Jersey, New York metropolitan area. Can handle additional line A-1 tools, exclusive sales. Commission basis. SA-6751, American Machinist.

MANUFACTURERS AGENT—well established in Southwestern Ohio (Columbus, Springfield, Dayton, Cincinnati) can now give time to an additional item of cutting tools, raw material or manufactured parts. Your investigation invited. RA-6855, American Machinist.

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Mechanical Engineer

with considerable shop design and sales experience has $15-20,000 to invest in going manufacturing firm where services could be utilized to advantage. BO-6290, American Machinist.

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before U.S. Patent Office. Validity and infringement investigations and opinions. Booklet and form "Evidence of Conception" forwarded upon request. Lancaster, Allwine and Rommel Registered Patent Attorneys. Suite 453, 815-15th Street, N. W. Washington 5, D. C.

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TUESDAY, NOVEMBER 16, 1948 at 11 A.M.

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Gould & Eberhardt 32-inch Industrial Shaper with 10 HP motor; 3 Bridgeport Turret Head motor driven Vertical Millers; 2 Brown & Sharpe 6x18 inch Surface Grinders with motors; Cincinnati motor driven 48 inch x 36 inch x 10 ft. Rapid Traverse Planer, box type with 3 heads; 4 Grob Band Filers, 18-inch throat; 3 Grob 18-inch Contour Saws with motors and Band Saw Welders; Sanford motorized Bench Grinder; Rockford motor driven Hand Miller; Continental motor driven Band Filer; 3 motor driven high speed Toolroom Drills; No. 2 Rockford motor driven Universal Miller; Ohio 16-inch Shaper; Hamilton motor driven back geared Drill Press; Becker motor driven Miller; 2 South Bend 9-inch x 3 ft. motor driven Bench Lathes; Monarch motor driven quick change Lathe; Reed and Hendey Lathes; Diamond Surface Grinder; Pexto Squaring Shear; Royersford motor driven Hack Saw; Kalamazoo motor driven Band Saw; Bench and Floor Drills; Grinders and Lathes; Furnaces, Vises, Motors, Benches, Chain Blocks, Small Tools, Desks, Chairs, Cabinets, Typewriters, Adding Machines, Safe, etc.

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Potter & Johnston 5 DE Machine
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Lodge & Shipley Duomatic Lathe.

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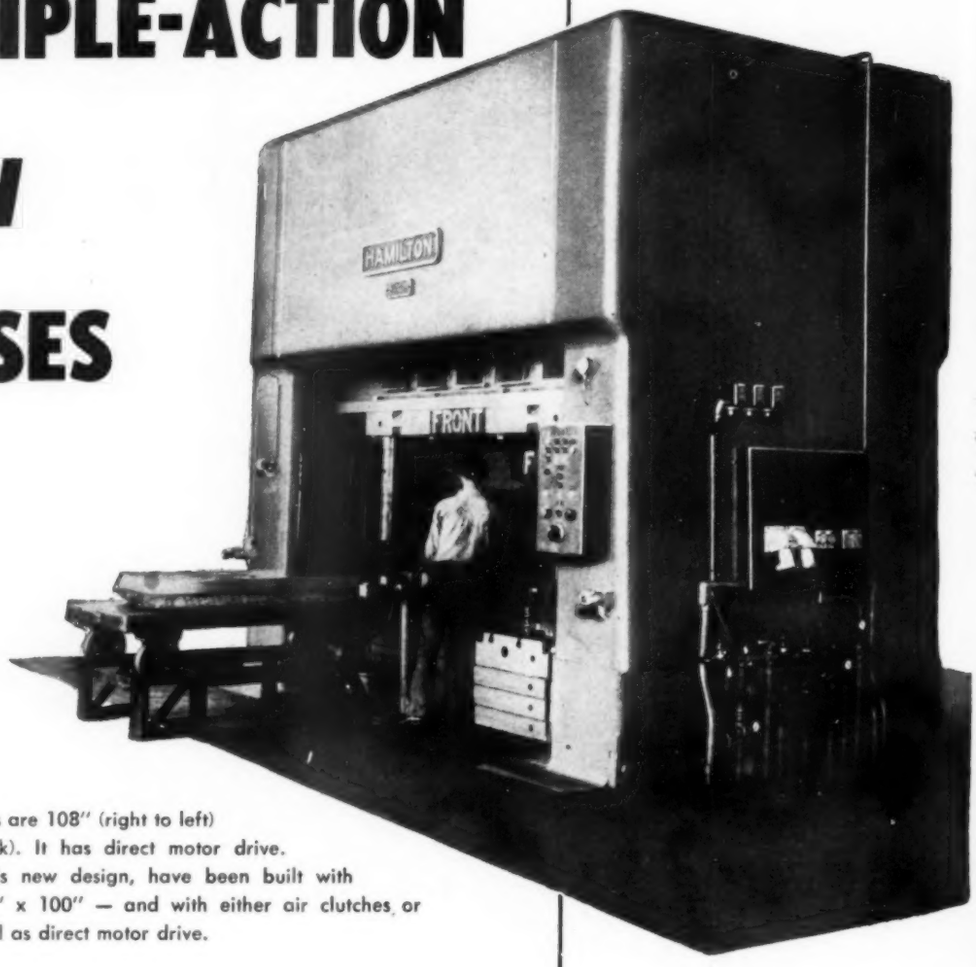
INDEX OF PRODUCTS ADVERTISED IN THIS ISSUE

Abrasives....18-19, 30-31, 59, 140, 237, 244
Accessories & Attachments (Machine Tool) 3, 184
Arbors & Mandrels 230
Balers, Scrap Metal 40
Bearings 16, 206, 218
Bending Machines 145
Books, Technical 232, 258
Boring, Drilling & Milling Machines (Horizontal) 220, 245
Boring & Turning Machines (Vertical) 72
Broaching Machines.....171, 217, 256
Castings 162, 222
Centrifugal Machines 236
Chucks 184, 236, 242, 252
Cleaning & Drying Machines & Supplies 191
Coolant Systems, Filters & Supplies 212, 238, 252
Counters 17
Cut-Off Machines; Sawing Machines...185, 227, 228, 242, 258
Dressers, Grinding Wheel.....254
Drilling Machines....20-21, 66, 75, 77, 82, 147, 165, 169, 182, 219, 228, 238, 244
Engineering & Production Services....220
Fabricating Methods & Services....33, 34
Fasteners...157, 167, 185, 208, 210, 240, 252
Finishing Machines 18-19, 40
Forgings 167, 214, 222
Gages & Instruments....63, 133, 134, 194, 198, 213, 220, 234, 242, 244, 256, 260
Gear Cutting Machines.....3, 6-7, 64, 149, 186, 248, 256
Gears, Speed Reducers, Motor Reducers 16, 28-29, 78, 159, 174, 182, 238, 247, 248, 249, 250
Gear Testers 3
Grinders—Cutter & Tool....177, 234, 254
Grinding Machines—Production..5, 12-13, 18-19, 44, 196, 228, 232, 259, 263
Heads: Drilling, Grinding & Tapping 184, 219, 238
Heat Treating Equipment & Supplies 56, 242
Honing Machines 158
Industrial Jewels 187
Jig Borers 75
Lathes, Automatic.....36-37, 40, 47, 76
Lathes, Engine.....40, 54, 69, 70, 143, 151, 155, 257, 261, 282
Lathes, Turret.....36, 37, 47, 48, 57, 61
Lubricants, Cutting Fluids, Quenching Oils, Rust Preventives....26, 27, 67, 68, 138, 187, 199, 208, 215, 230, 284
Lubricating Systems & Equipment.212, 252
Marking Machines & Tools.....183, 258
Materials, Cutting & Forming.....183
Materials of Manufacture...4th Cover, 51, 153, 163, 172, 179, 180, 202, 205, 214, 222, 226, 278
Materials Handling Equipment...170, 229
Millers, Die Sinkers, Profilers...4, 8, 9, 14, 15, 38, 39, 65, 239
Parts & Equipment, Electrical..24, 25, 189, 190, 192, 193, 211
Parts & Equipment, Hydraulic & Pneumatic 55, 188, 200, 225, 241
Planers 24, 50, 52, 69
Plastic & Rubber Molding Machines...146
Power Transmission....16, 28, 29, 197, 233
Presses, Forging & Forming Equipment & Supplies....22, 23, 33, 34, 42, 43, 55, 58, 74, 167, 168, 173, 184, 188, 216, 232, 238, 244, 252, 255, 256, 280
Production, Inventory & Tool Control..164, 263
Refrigerating Equipment.....176
Riveting Machines.....232, 240
Safety Equipment 260
Screw Machines; Chucking Machines .....3rd Cover, 41, 73, 240
Shapers, Slotters, Keyseaters...69, 84, 228, 241, 262
Shop Furniture 62
Special Machine Tools 254
Steel Blue 240, 242
Swaging Machines 238
Tapping Machines 184, 238
Threading Machines 10, 11, 178, 208
Tooling Set-Up Equipment.....234
Tools, Cutting....10, 11, 32, 35, 45, 49, 53, 60, 136, 160, 161, 171, 181, 186, 195, 209, 212, 217, 221, 223, 224, 227, 230, 231, 236, 238, 246, 250, 251, 253, 256, 262
Tools, Hand 71
Tools, Portable.....46, 75, 234, 243
Vibration Control 207
Welding & Cutting, Brazing & Soldering Equipment & Supplies.....180, 204, 216
Wiping Cloths 166

New Design

IN TRIPLE-ACTION DRAW PRESSES



Dimensions of this press are 108" (right to left) by 64" (front to back). It has direct motor drive. Similar presses, of this new design, have been built with dimensions up to 200" x 100" — and with either air clutches or dynamatic drive as well as direct motor drive.

Illustrated here is the lead press in a line of Hamilton presses producing automobile outer and inner door panel and pillar stampings. The operating mechanism of this new triple-action press is underneath, conveniently accessible from the basement for periodical inspection and servicing — thereby eliminating the hazards involved in performing these duties thirty or more feet above the factory floor.

The rod connections which actuate the two upper slides are in tension when the press is under load. This is an exclusive Hamilton feature which provides the means for improving the quality of the stampings, reducing sheet breakage, saving time in die setups and increasing die life.

Further information on the superior design and cost-saving features of Hamilton presses can be obtained from the Lima-Hamilton Corporation, Press Division, Curtis Building, Detroit 2, Michigan.

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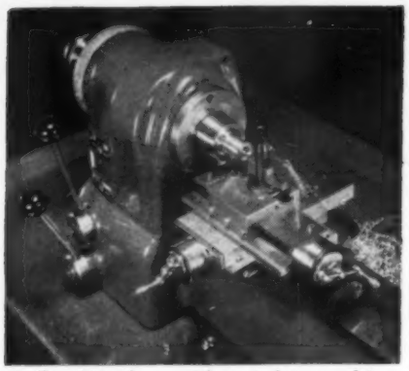
ADVERTISERS INDEX

	Page
Acheson Colloids Corp.	284
Air Reduction	204
Allen-Bradley Co.	189, 190
Allied Products Corp.	167
Allis-Chalmers Mfg. Co.	28, 29
Allison Company	237
Almond Mfg. Co., T. R.	242
Aluminum Co. of America	51
American Chain & Cable Co., Inc.	201
American Electric Fusion Corp.	33, 34
American Screw Co.	157
American Steel Foundries King Machine Tool Div.	72
American Tool Works Co.	20, 21
Ampco Metal Inc.	180
Anton Machine Works	242
Armstrong-Blum Mfg. Co.	35
Armstrong Bros. Tool Co.	71
Atlantic Gear Works	250
Atlas Press Co.	257
Auto Engine Works Inc.	238
Automatic Transportation Co.	229
Baldwin Southwark Div. Baldwin Locomotive Works	22, 23
Barber Colman Co.	32, 64
Bardons & Oliver Inc.	48
Barnes Co., Inc., W. O.	160
Barrett Co., Leon J.	236
Bath Co., Cyril	145
Baumbach Mfg. Co., E. A.	238
Beatty Machine & Mfg. Co.	168
Bellows Co.	55
Bilgram Gear & Machine Works	248
Black & Decker Mfg. Co.	175
Black & Webster Inc.	216
Black Drill Co.	212
Blake Co., Edward	254
Blanchard Machine Co.	44
Boston Gear Works, Inc.	159
Braun Gear Co.	248
Brown & Sharpe Mfg. Co.	49, 212
Bryant Machry. & Engrg. Co.	75
Bullard Co.	36, 37
Butterfield Div. Union Twist Drill Co.	45
Campbell Div., Andrew C., American Chain & Cable Co., Inc.	201
Carboloy Co., Inc.	161
Carlton Machine Tool Co.	228
Chase Brass & Copper Co., Inc.	226
Chicago Latrobe Twist Drill Wks. Div., United Drill & Tool Corp.	253
Cincinnati Bickford Tool Co.	77
Cincinnati Gear Co.	248
Cincinnati Grinders Incorporated	5
Cincinnati Lathe & Tool Co.	54
Cincinnati Milling Mach. Co.	4
Cincinnati Planer Co.	52
Cincinnati Shaper Co.	84
Clark Tructractor Div. Clark Equipment Co.	170
Clausing Mfg. Co.	246
Cleereman Machine Tool Co.	75
Clemson Bros., Inc.	186
Cleveland Automatic Machine Co.	41
Cleveland Punch & Shear Wks. Co.	58
Cleveland Twist Drill Co.	60
Columbus Die Tool & Mach. Co.	254
Cone Automatic Machine Co.	73
Consolidated Mach. Tool Corp.	65
Coulter Machine Co., James	208
Covel Manufacturing Co.	177
Crocker Wheeler Elec. Mfg. Co.	192, 193
Cross Co.	186
Curtis Pneumatic Machy. Co.	241
Danly Mach. Specialties Inc.	42, 43
Davis & Thompson Co.	220
Davis Keyseater Co.	228
Dayton Rogers Mfg. Co.	242
Dayton Rubber Mfg. Co.	197
Detroit Bevel Gear Co.	249
Detroit Broach Co.	217
Diamond Machine Tool Co.	242
Diecraft	258
DoAll Co.	216
duMont Corp.	230
Dykem Co.	240
Eastern Machine Screw Corp.	250
Elgin National Watch Co.	187
Elmes Engineering Works	255
Errington Mechanical Laboratory	236
Etna Machine Co.	232
Ex-Cell-O Corporation	245
Fellows Gear Shaper Co.	6, 7
Felters Co.	207
Fosdick Machine Tool Co.	66
Gairing Tool Co.	221
Gallmeyer & Livingston Co.	228
Ganschow Gear Co.	248
Gates Rubber Co.	233
General Electric Co. Apparatus Dept.	56
Gisholt Machine Co.	40, 57
Gleason Works	3
Goss & deLeeuw Machine Co.	240
Graham Mfg. Co.	234
Grant Gear Works	249
Grant Mfg. & Machine Co.	240
Gray Co., G. A.	50
Greenlee Bros. & Co.	169
Gulf Oil Corp.	199
Hannifin Corporation	200
Hanson Whitney Machine Co.	209
Hardinge Bros., Inc.	282
Hartford Special Machinery Co.	249
Hassall Inc., John	185
Heald Machine Co.	2nd Cover
Henry & Wright Mfg. Co.	74
Holman Reamer Co.	256
Hones, Inc., Charles A.	242
Hovis Screwlock Co.	244
Howell Electric Motors Co.	211
Hoyland Steel Co.	183
Ingersoll-Rand Co.	243
International Nickel Co., Inc.	163
J & S Tool Co.	254
Jones & Lamson Machine Co.	76
Kalamazoo Tank & Silo Co. Machine Tool Div.	185
Kearney & Trecker Corp.	38, 39
Kent-Owens Machine Co.	239
Kester Solder Co.	216
Kex National Service	166
King Machine Tool Co.	72
L. W. Chuck Co.	258
Landis Machine Co.	10, 11
Landis Tool Co.	12, 13
Langelier Mfg. Co.	238
LaPointe Machine Tool Co.	171
Leach Machinery Co., Inc., H.	259
Lebanon Steel Foundry	162
LeBlond Mach. Tool Co., R. K.	70
Lees-Bradner Co.	178
Leland-Gifford Co.	147
Lima-Hamilton Corp.	280
Link-Belt Co.	16
Linley Bros. Co.	232
Lodge & Shipley Co.	143
Luers, J. Milton	238
Lufkin Rule Co.	213



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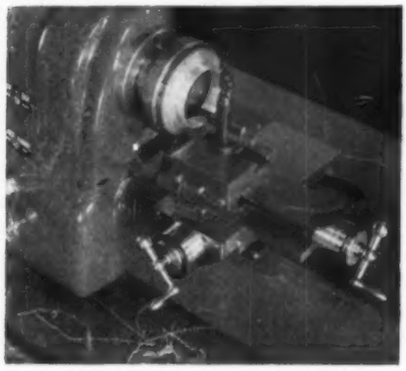

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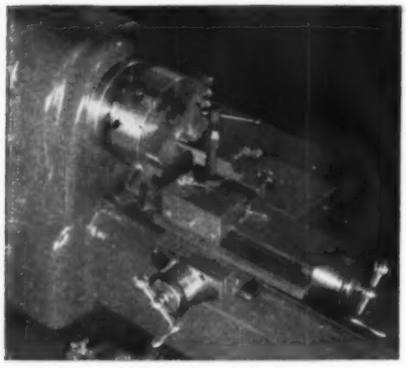

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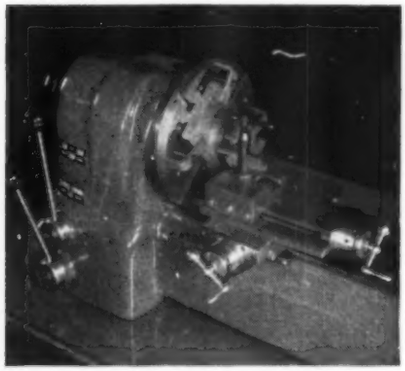

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ADVERTISERS INDEX

	Page
Marshalltown Mfg. Co.	228
Mattison Machine Works	196
McCaskey Register Co.	164
McGraw-Hill Book Co., Inc.	232, 258
Mead Specialties Co.	188
Meisel Press Mfg. Co.	250
Michigan Tool Co.	149
Micromatic Hone Corp.	158
Midvale Company	222
Monarch Machine Tool Co.	151
Montgomery Machine Tool Accessories	263
Morris Machine Tool Co.	82
Motch & Merryweather Machy. Co.	231
Mueller Brass Co.	202
National Bearing Div. American Brake Shoe Co.	278
National Broach & Machine Co.	235
National Forge & Ordnance Co.	214
National Machine Tool Co.	238
Newark Gear Cutting Machine Co.	248
New Britain-Gridley Machine Div. New Britain Machine Co.	3rd Cover
Niagara Blower Co.	176
Nicholson & Co., W. H.	230
Nicholson File Co.	195
Noble & Westbrook Mfg. Co.	183
Norma-Hoffmann Bearings Corp.	218
Norton Company	18, 19, 30, 31, 59
O.K. Tool Co.	136
Oakite Products Inc.	191
Oliver Instrument Co.	234
O'Neil-Irwin Mfg. Co.	188
Ottemiller Co., Wm. H.	252
Parker-Kalon Corp.	210
Perkins Machine & Gear Co.	174
Philadelphia Gear Works, Inc.	247
Potter-Johnston Co.	47
Pratt & Whitney Div. Niles-Bement-Pond Co.	46
Procunier Safety Chuck Co.	184
Production Machine Co.	263
Randall Co., Frank E.	234
Red Wing Motor Co.	244
Reeves Pulley Co.	78
Republic Steel Corp.	205
Revere Copper & Brass Inc.	153
Rockford Machine Tool Co.	69
Ruthman Machinery Co.	238
Ryerson & Sons Inc., Joseph T.	179
S.K.F. Industries Inc.	206
Safety & Maintenance Co.	260
Sales Service Machine Tool Co.	184
Scherr Co., Inc., George	260
Scully-Jones & Co.	251
Sentry Co.	236
Sewall Mfg. Co., E. B.	182
Sheffield Corp.	133
Sheldon Machine Co., Inc.	261
Shore Instrument & Mfg. Co., Inc.	256
Sidney Machine Tool Co.	155
Sigourney Tool Co.	244
Simonds Abrasive Co.	140
Sinclair Refining Co.	26, 27
Smith & Mills Co.	262
Snow Manufacturing Co.	219
Stahl Gear & Machine Co.	250
Standard Gage Co., Inc.	198
Standard Oil Co. (Indiana)	67, 68
Standard Pressed Steel Co.	62, 240
Standard Tool Co.	223, 224
Staples Tool Co.	262
Strand Co., N. A.	234
Stuart Oil Co. Ltd., D. A.	187
Sturgis Products Co.	230
Sundstrand Machine Tool Co.	14, 15
Sun Oil Company	138
Taft-Peirce Mfg. Co.	194
Taylor & Fenn Co.	182
Thompson Grinder Co.	203
Tidewater Associated Oil Co.	215
Timken Roller Bearing Co. (Steel & Tube Div.)	4th Cover
Tuthill Pump Co.	252
Union Twist Drill Co.	53
Unit Machinery Co.	220
V. & O. Press Co.	256
Van Keuren Co.	63
Van Norman Co.	8, 9
Veeder-Root Inc.	17
Vickers Inc.	225
Victor Saw Works Inc.	186
Vitrified Wheel Co.	244
Walker Co., Inc., O. S.	252
Walker-Turner Co., Inc.	165
Waltham Machine Works	256
Warner & Swasey Co.	61
Webber Gage Co.	134
Weldon Tool Co.	250
Wells Mfg. Corp.	227
Wendt-Sonis Co.	181
Westfield Metal Products Co.	208
Westinghouse Electric Corp.	24, 25
Wheelock Lovejoy & Co., Inc.	172
Whistler & Sons Inc., S. B.	173
White & Bagley Co.	208
Wilson Mechanical Instrument Co.	220
Zagar Tool Inc.	256
Zeh & Hahnemann Co.	252

SEARCHLIGHT SECTION

(Classified Advertising)

	Page
EMPLOYMENT	
Positions Vacant	264
Selling Opportunities Offered	264
Employment Services	264
Positions Wanted	264, 277
Selling Opportunities Wanted	277
SPECIAL SERVICES	
Contract Work	264
Arrow Metals Inc.	264
Dayton Rogers Mfg. Co.	264
General Pattern Works	264
Kamis Engineering Co.	264
Orange Pattern Works	264
Portage Machine Co.	264
Premier Mill Corp.	264
Slocomb Corp., F. P.	264
BUSINESS OPPORTUNITIES Offered	277
NOTICES Auction	277
EQUIPMENT (Used or Surplus New) For Sale	265-277

ADVERTISERS INDEX

Aaron Machinery Co.	273
American Electrical Sales Co.	276
Bennett Machinery Co.	274
Botwinik Bros. Inc.	274
Botwinik Bros. of Mass., Inc.	270
Brooks Inc., B.D.	272
Brownell, Hazard	274
Capitol Machinery Corp.	268
Continental Salvage & Machy. Corp.	270
Dony Machinery Co.	268
Eastern Machinery Corp.	267
Emerman Machinery Corp.	266
Falk Machinery Co.	269
Freeman, Samuel T.	277
General Salvage Co.	274
Haag, Joseph	276
Harrison Machinery Exchange, Inc.	266
Hill-Clarke Machinery Co.	275
Howarth Machinery Co.	272
Hyman & Son, Joseph	277
Indianapolis Machy. & Supply Co.	271
Judge & Co., Inc., Frank M.	274
Kings County Machy. Exchange	276
Lang Machinery Co.	272
Leiman Bros., Inc.	276
Lucas & Son, Inc., J. L.	272
Miles Machinery Co.	270
Morey Machinery Co.	269
National Machinery Exchange	270
O'Brien Machinery Co.	276
O'Connell Machinery Co.	272
Osborne & Sexton Machinery Co.	268
Osmun Inc., R. V.	276
Paul's Machinery Co.	274
Reynolds Machinery Co.	266
Sier-Bath Gear & Pump Tool Co.	277
Simmons Machine Tool Co.	277
Victor Machinery Exchange	266
West Penn Machinery Co.	268
Winston Machinery Co., Inc.	269

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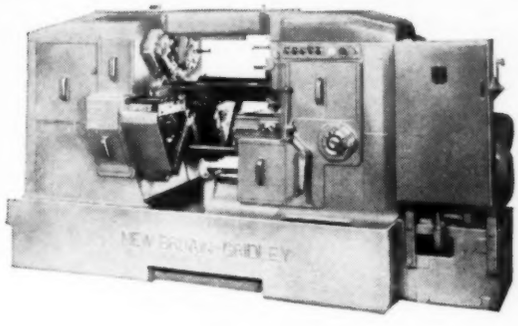

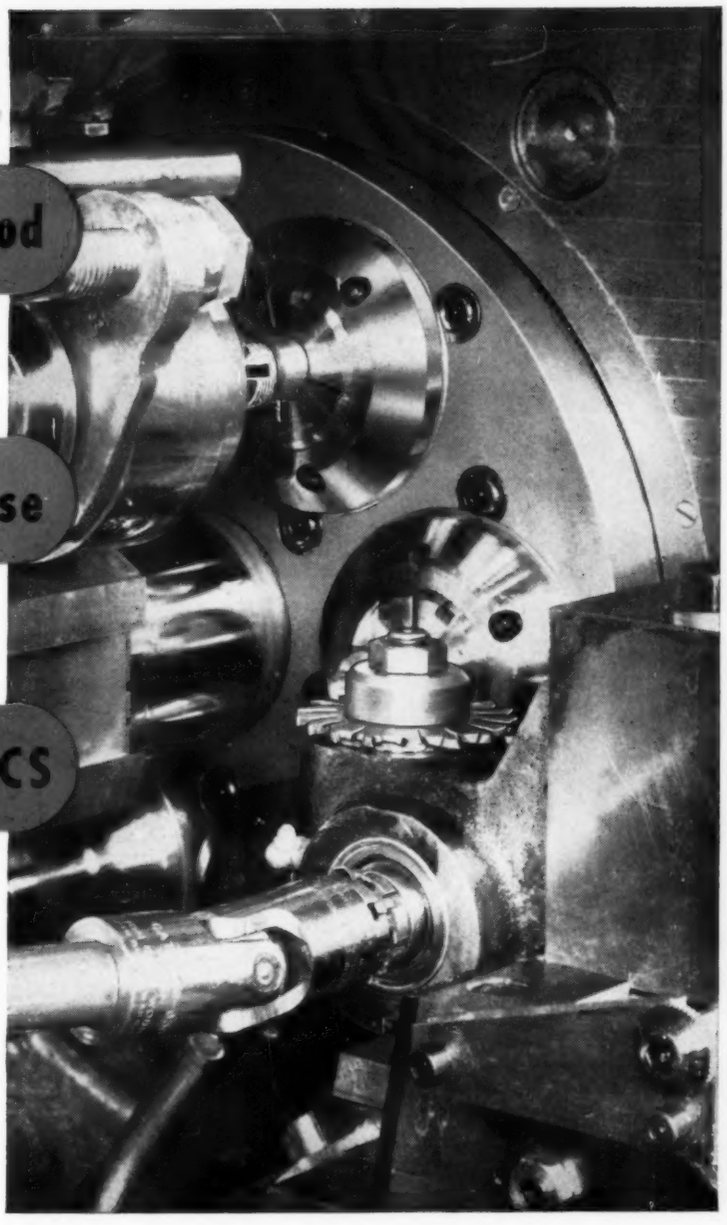

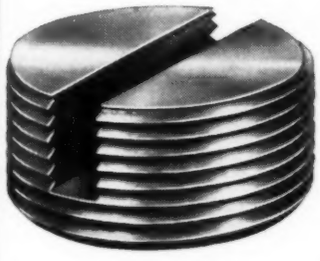

Putting a $\frac{5}{16}$" slot in this $\frac{31}{64}$" thick plug formerly was a second milling machine operation in a leading automotive plant. The small gripping surface made handling slow and the piece costly.

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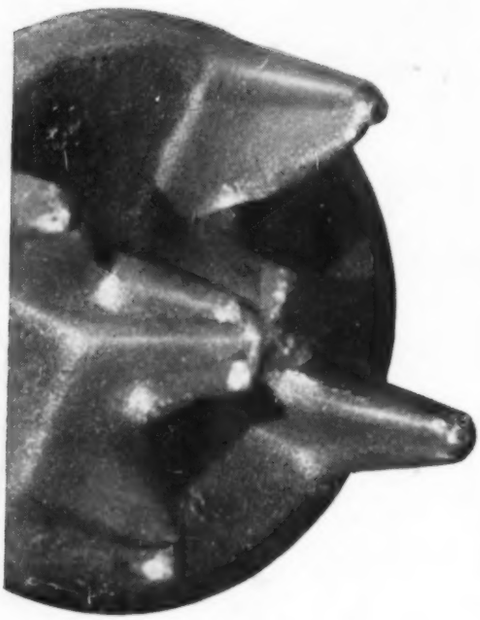

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